PERIODICAL DEPT.

OCTOBER 1951

FOUNDRY

...WHEREVER METALS ARE CAST

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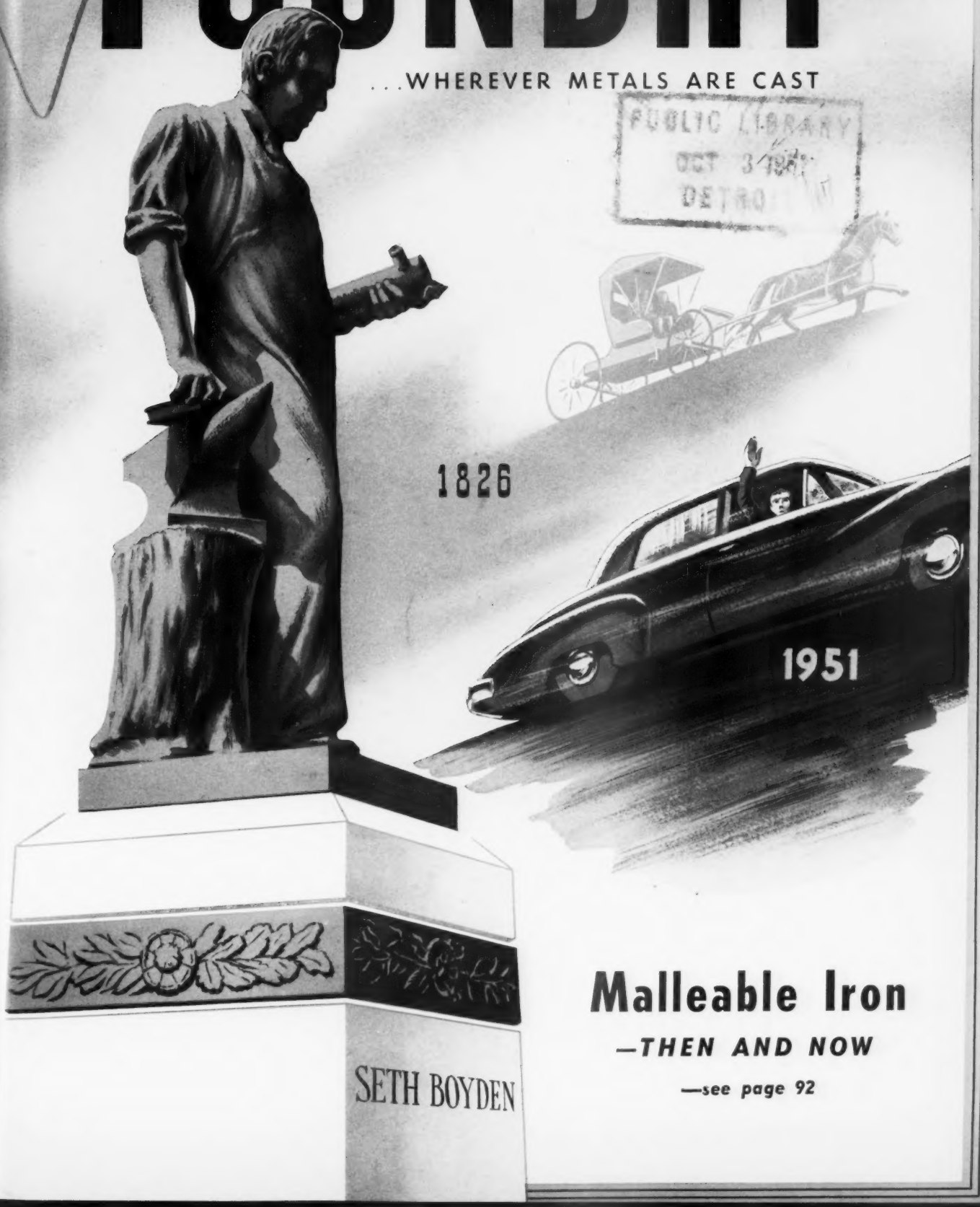


Malleable Iron

—THEN AND NOW

—see page 92

get

CLEANER...

SOUNDER...

BETTER

IRON CASTINGS

with

PURITE

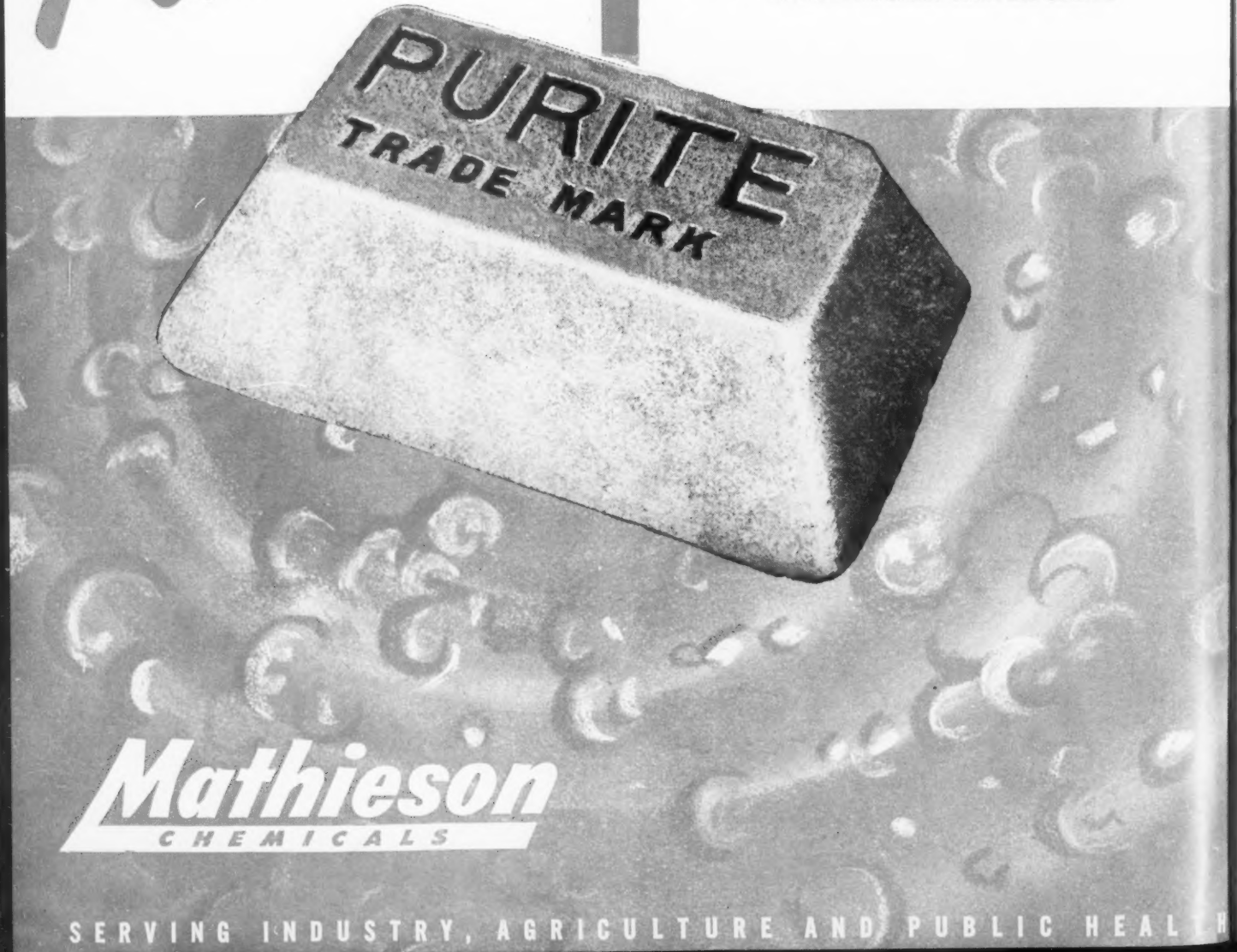
Progressive foundries throughout the country have standardized on Purite as their desulphurizer and cupola flux for improved iron castings. And their reasons for this practice are seven-fold:

1. **Purite gives 100% fluxing action in the cupola — 100% desulphurizing action in the ladle.**
2. **Purite gets to the iron faster — no quicker desulphurizer made.**
3. **Purite is time-tested and proven for unsurpassed desulphurizing uniformity.**
4. **Purite comes in 2-lb. pigs — no weighing or measuring required.**
5. **Purite is 100% pure fused soda ash — you do not pay for inert materials.**
6. **Purite does not crumble — no waste — no dust.**
7. **Purite can be shipped in bulk carloads at substantial savings over bag shipments — is easily stored without deterioration.**

These benefits prove why Purite enjoys such widespread acceptance among iron foundries as the foremost cupola flux and desulphurizing agent. Write today for full information on how the quality of your iron castings can be improved with Purite. Mathieson Chemical Corporation, Mathieson Building, Baltimore 3, Md.

PURITE 100% fused soda ash. The Scientific Flux for Better Melting and Cleaner Iron.

PURITE is sold by all leading foundry supply houses in the United States and Canada.



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DUCTILE IRON

A Revolutionary Metallurgical Development

DUCTILE IRON is a cast ferrous product which combines the *process advantages* of cast iron with many of the *product advantages* of cast steel.

No longer in the pilot-plant stage, this new material is now produced and sold on the basis of specifications. Not only are its individual properties exceptional, but no other common engineering material provides such a combination of excellent castability and fluidity, with high strength, toughness, wear resistance, and machinability.

Actually, "ductile iron" denotes not a *single* product, but rather a family of ferrous materials characterized by graphite in the form of spheroids . . . a form controlled, in a broad sense, by small amounts of magnesium. Presence of spheroidal rather than flake graphite gives this new product a ductility that is unique among gray cast irons.

Four important types of ductile iron now being produced commercially are tabulated below.

REPRESENTATIVE MECHANICAL PROPERTIES OF COMMERCIAL HEATS OF DUCTILE IRON

	Grade	Tensile strength, psi	Yield strength, psi	Elongation per cent	BHN	Usual condition
A	90-65-02	95/105000	70/75000	2.5/5.5	225/265	As-cast
B	80-60-05	85/95000	65/70000	5.5/10.0	195/225	As-cast
C	60-45-15	65/75000	50/60000	17.0/23.0	140/180	Annealed
D	80-60-00	85/95000	65/75000	1.0/3.0	230/290	As-cast

A Pearlitic in structure. Provides good mechanical wear resistance.

B Pearlitic-ferritic in structure. Provides strength and toughness combined.

C A fully ferritic structure usually obtained by short anneal of either (A) or (B). Provides optimum machinability and maximum toughness.

D Higher phosphorous content than preceding grades, also higher manganese. Provides high strength and stiffness, but only moderate impact strength.

SOME UNIQUE PROPERTIES OF DUCTILE IRON

1. Its elastic modulus, about 25,000,000 psi, is virtually unaffected by composition or thickness . . .

2. It can provide a chilled, carbidic, abrasion-resistant surface supported by a ough ductile core. No other single material can combine these properties . . . its only counterpart being a tough material coated with a hard welded overlay.

3. As-cast ductile iron of 93,000 psi tensile strength has the same machinability rating as gray iron with a strength of 45,000 psi.

4. Annealed ductile iron can be machined at a rate 2 to 3 times that of good quality gray iron.

5. It can be satisfactorily welded.

APPLICATIONS

Automotive, agricultural implement, railroad and allied industries apply ductile iron, as-cast and heat treated, in components too numerous to detail.

Machinery, machine tools, crankshafts, pumps, compressors, valves and heavy industrial equipment such as rolls and rolling mill housings, utilize its high strength and rigidity.

In scores of engine, furnace and other parts serving at elevated temperatures, it provides oxidation and growth resistance heretofore unavailable in high carbon castings.

Other applications include paper, textile and electrical machinery, marine equipment, and pipe.

YOUR OPPORTUNITY

Join the increasing number of successful foundries now producing Ductile Iron. Write for additional information on the production advantages and types of castings for which Ductile Iron has been adopted . . . mail the coupon now.

EMBLEM OF INCO SERVICE
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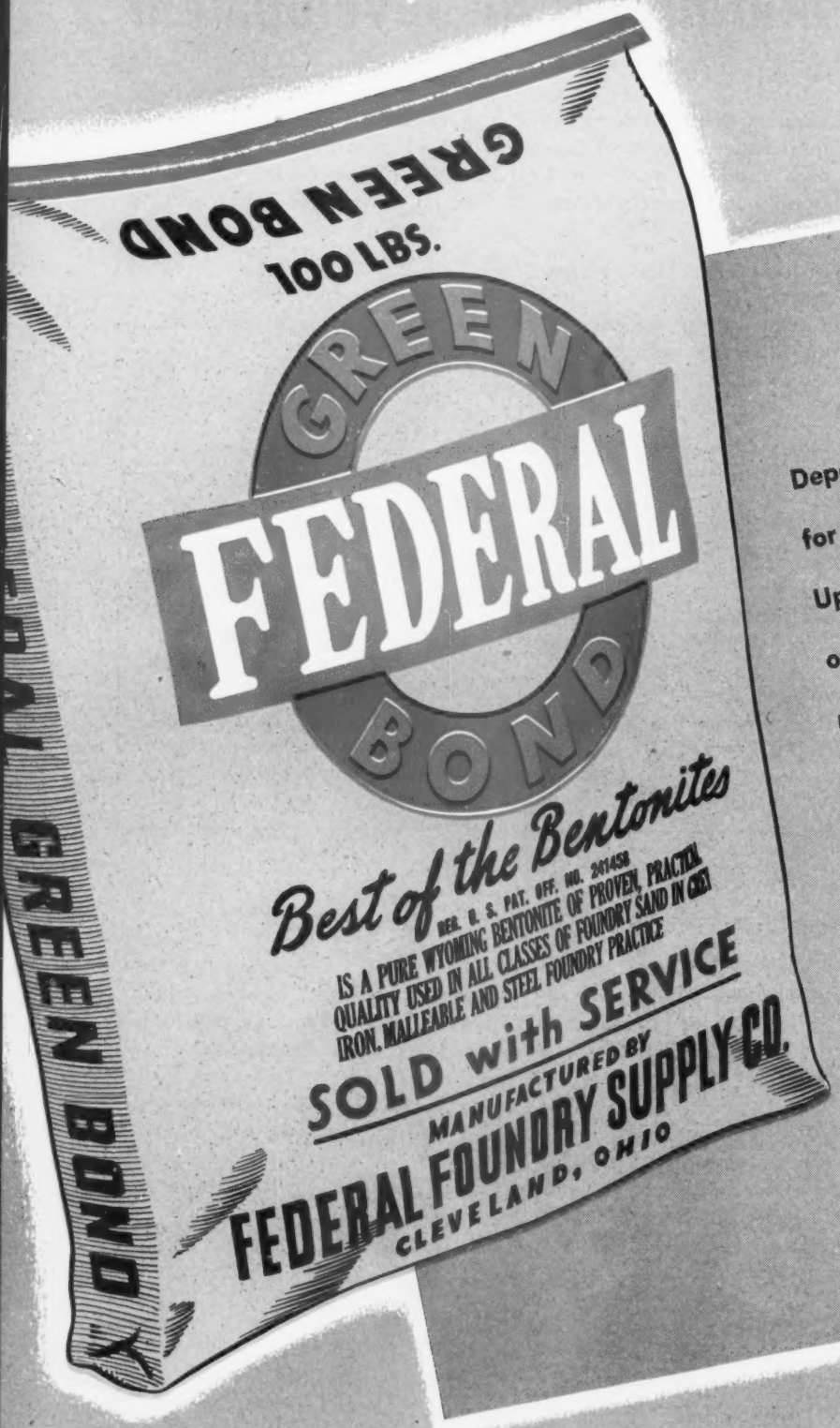
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BOND
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IS A PURE WYOMING BENTONITE OF PROVEN, PRACTICAL QUALITY USED IN ALL CLASSES OF FOUNDRY SAND IN GREY IRON, MALLEABLE AND STEEL FOUNDRY PRACTICE
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CLEVELAND, OHIO
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OCTOBER 1951

FOUNDRY

VOLUME 79—NUMBER 10

NBP CCA

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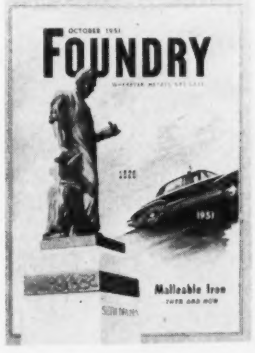

THE COVER: Seth Boyden, who discovered American malleable iron 125 years ago, is honored by this statue in Newark, N. J.

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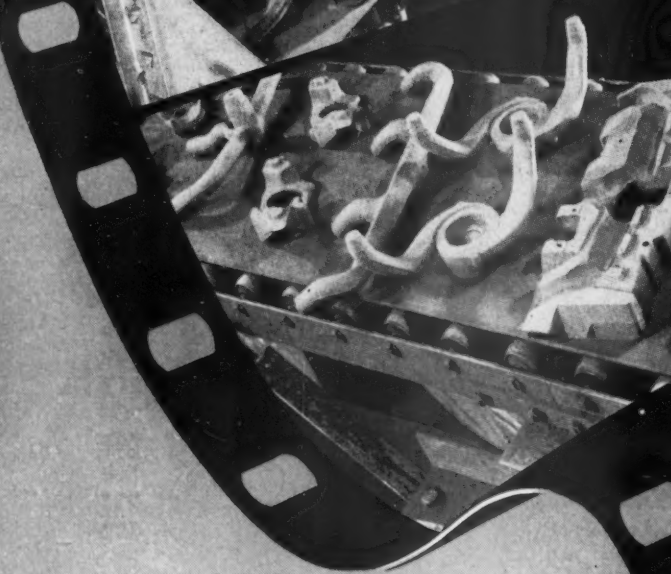
see what happens to
SCRAP when CONTROL
TAKES OVER →

in the film"



a factual 16 mm color-sound movie that discusses problems common to all core rooms.

- ***EDUCATIONAL***
- ***INTERESTING***
- ***INFORMATIVE***

produced by Foundrymen for Foundrymen

"THE ADM OF CORES"

"The ADM of Cores" is a picture about any foundry's cores; the materials they are made from, the steps in their manufacture. "The ADM of Cores" is actually a story of core room control. It demonstrates how the same careful control of the laboratory can be applied in production core making . . . how the many variables that cause core failure and subsequent scrap, can be eliminated.

This is a technical movie. It doesn't try to sell anything except care, control, and common sense. Many core problems that are common to all types of foundries are graphically discussed in plain foundry lingo. There is no staging—all shots were made in either production foundries or in the A.D.M. Sand Research Laboratory in Minneapolis.

MAKE RESERVATIONS NOW
FOR FREE SHOWING

Prints are available for any foundry meeting, supervisory gathering, technical association, get-together or clinic.
Every foundryman should see this film—from the boss right down to the sweeper. Schedules are being completed now—don't be disappointed.

HERE'S HOW—*Write giving this information:*

Name of Organization—Number of People, Location and Date you have selected. A Linoil Man will show it for you, or assist you in making arrangements.

ARCHER • DANIELS • MIDLAND COMPANY

Foundry Products Division

2191 West 110th Street **Dept. A-1** **Cleveland 2, Ohio**

SPEED UP
CLEANING of LARGE CASTINGS

If cleaning large castings is a *s-l-o-w* process in your plant—*speed up* your cleaning operation with a Pangborn Air Blast Cleaning Room!

Work can be loaded or unloaded from *both* ends and heavy, cumbersome castings are quickly and easily handled with either a car or overhead conveyor. Large castings are cleaned in a jiffy, assuring you a *smooth flow of work* from shakeout, through cleaning and on to grinding and inspection.

Pangborn has *job-proven* Air Blast Room designs to meet all cleaning requirements. Features include plenty of illumination on the work, automatic abrasive recovery which removes sand, refuse and dust *before* returning abrasive for re-use.

For Full Details on Pangborn Air Blast Cleaning Rooms for your plant, write today to: PANGBORN CORPORATION, 1400 Pangborn Blvd., Hagerstown, Maryland.

Look to Pangborn for the Latest Developments in Blast Cleaning and Dust Control Equipment

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BLAST CLEANS CHEAPER with the right equipment for every job

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If you haven't heard it . . .

IT'S NEWS!

AMBITION — working yourself to death so you can live better.

* * *

WE ALWAYS KNEW "you can't take it with you" but with taxes, inflation and all, it's getting so you can't even keep it while you're here.

* * *

MONEY TALKS. But in these days the dollar doesn't have enough cents to say anything worthwhile.

* * *

HOW MUCH IS A BILLION? If you started in business in the year 1 A.D. with a capital of one billion dollars and managed your business so poorly that you lost $1,000 a day every day throughout the years, in this year 1951 you would still have enough of the original billion left to keep on losing $1,000 a day for the next 800 years!

* * *

A FORTUNE awaits the man who invents a chocolate with a lettuce center for people on a diet.

* * *

FRIEND OF OURS BACK HOME writes that it's more than a coincidence that about the time the old backyard hammock went out, ulcers came in.

* * *

SPEAKING OF ULCERS, the defense production speed-up has resulted in a lot of king-size worries for foundrymen all over the U. S. Here's a suggestion: why not let Pangborn engineers take a large part of the worry off your shoulders? While not a cure-all for every problem, Pangborn Rotoblast is doing a whale of a job breaking cleaning room bottlenecks and cutting costs of this essential operation. A short letter may work wonders. Drop a line today to Pangborn Corporation, Hagerstown, Maryland.

* * *

WHENEVER YOU GET to feeling discouraged remember the guy who made a fortune in flea powder started from scratch.

* * *

SOMEHOW, in this hurry-hurry world there's something refreshing in the news that in England the fox, hounds and hunters have the right of way over trains during the hunting season.

* * *

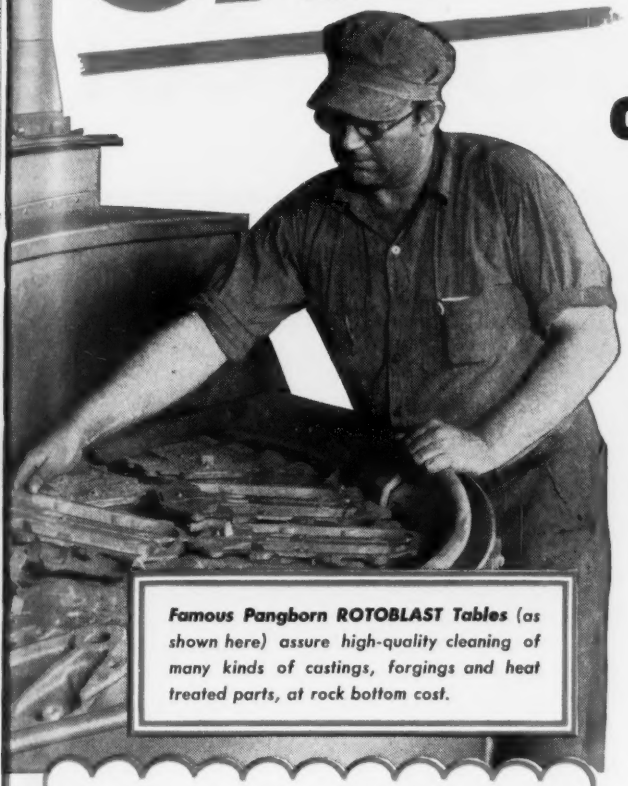
INCIDENTALLY, things are getting so bad in England that even the grave digging is being carried on by a skeleton staff.

* * *

NOT ALL GOODWILL PROGRAMS cost money; one of the best instruments of public relations ever invented is the smile.

SAVE SAVE SAVE

on BLAST CLEANING with PANGBORN ROTOBLAST*



Famous Pangborn ROTOBLAST Tables (as shown here) assure high-quality cleaning of many kinds of castings, forgings and heat treated parts, at rock bottom cost.

BY THE WEEK: One foundry, with ROTOBLAST, slashes *$211.56* every week off their blast cleaning bill. An additional saving in this case is *lower breakage losses*—important in any foundry producing intricate and fragile castings.

BY THE MONTH: One more foundry credits ROTOBLAST with saving $423.30 *each month* on blast cleaning. To prove that blast cleaning goes faster with ROTOBLAST, castings are now cleaned in 1/3 the time it used to take!

BY THE YEAR: $10,160 saved on labor alone each year—that's the story from a large ROTOBLAST-equipped foundry. But there are still more savings: five old-fashioned machines with bothersome dust have been completely eliminated—important for a foundry where space is at a premium!

ROTOBLAST makes cash savings possible these five different ways:

SAVES LABOR: *One ROTOBLAST machine and operator can do as much as a two-man crew and old-fashioned equipment.*

SAVES SPACE: *In many cases, one ROTOBLAST machine replaces five or more old-fashioned machines, requires less space.*

SAVES TIME: *Cases on record prove ROTOBLAST can cut cleaning time up to 95.8% compared to older methods.*

SAVES POWER: *Modern ROTOBLAST uses but 15-20 h.p. compared to old-fashioned equipment requiring 120 h.p. for same job.*

SAVES TOOLS: *On work cleaned with ROTOBLAST, cutting tools last up to 3 times longer because no scale is left to dull edges.*

SAVINGS mean PROFITS

Find out how much you can save!

If you're hampered by old-fashioned blast cleaning methods, you can *save money* with ROTOBLAST. There's a modern, economical, efficient ROTOBLAST *Barrel, Room, Table* or *Table-Room* especially designed to solve every blast cleaning problem. Let Pangborn engineers show what ROTOBLAST can do for you. Write today for Bulletin 214 to PANGBORN CORPORATION, 1400 Pangborn Blvd., Hagerstown, Maryland.

Look to Pangborn for the Latest Developments in Blast Cleaning and Dust Control Equipment

MORE THAN 25,000 PANGBORN MACHINES SERVING INDUSTRY

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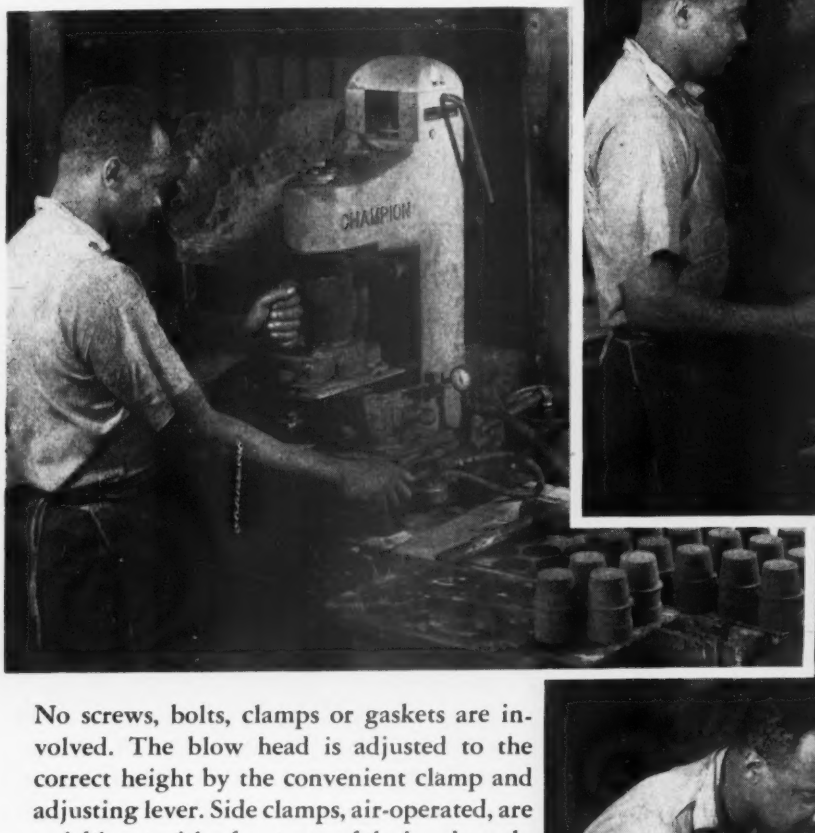
FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

BLAST CLEANS CHEAPER with the right equipment for every job

CHAMPION'S Quick Ups Core

In these views, taken in the foundry of W. D. Allen Manufacturing Company, Bellwood, Ill., you can see how easy it is to change from one core box to another on the Champion CB5, "Junior" Core Blower. The first job used a triple box. The blowplate, with three blow-holes, was detached with a simple tap of the bare fist, and the second plate with two blow-holes, was instantly slipped into place.



No screws, bolts, clamps or gaskets are involved. The blow head is adjusted to the correct height by the convenient clamp and adjusting lever. Side clamps, air-operated, are quickly set with a few turns of the hand crank.

No tools are needed. All adjustments are quickly made with the bare hands.

Haven't you a core job that can be blown better, faster, on a CB5? Why not look into this, today?

Ask Yourself:

HOW FREE IS AIR?

Ever stop to think that the power to drive air compressors is an important item in foundry costs? And that the higher the pressure, the more it costs per cubic foot? And, furthermore, that excessive pressures are the principal cause of core box wear and high machine maintenance?

Champion Core Blowers and Molding Machines, among their various excellent features, operate on pressures as low as 85 lbs. with great ease and full efficiency. Where exceedingly high pressures are carried in the line, regulators are recommended.

Plants equipped with Champions enjoy a substantial saving in operating costs, at no sacrifice in productive efficiency.

changeover production

LARGE BRASS FOUNDRY FINDS CHAMPION CB5 A BIG TIME SAVER

Producing cores at a high rate of speed is a good reason to be well pleased with the Champion CB5 Core Blower. But at the W. D. Allen Manufacturing Company, they are equally well pleased with the speed at which it can be changed from one job to another. In less than two minutes after one lot of cores is completed, the machine is ready to blow the next lot. At the Allen Foundry, the CB5 works 8 hours a day, on as many as 10 or 12 different types of core. No wonder its quick changeover is appreciated.

EASY ON CORE BOXES, TOO

Because the Champion works efficiently on moderate air pressure, it is far easier on core boxes, than if it required extra high pressure. This is a special advantage where wooden boxes are used, as is common on short orders. But users of any size Champion Core Blower will tell you that Champions are easy on any type of core box.

Speed, safety, easy operation, low upkeep, are outstanding features of Champion molding machines and core blowers, which have made them favorites in leading foundries for many years. Champion production specialists will be glad to explain and demonstrate how you can speed production and improve working conditions with Champion equipment. Let's discuss your problems. We know we can help solve them.

Champion

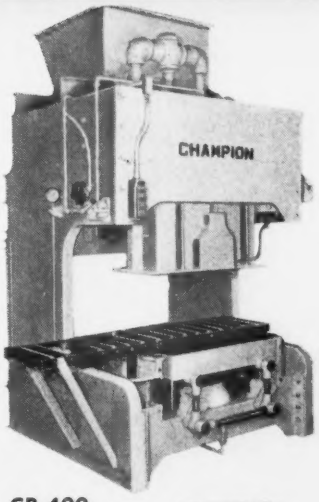
FOUNDRY AND MACHINE CO.

MAIN OFFICE AND PLANT ROCKFORD, ILLINOIS

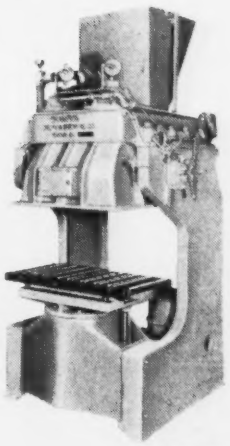
SALES OFFICE 1553 W. MADISON ST., CHICAGO 7, ILL.

OLDING MACHINES CORE BLOWERS THE ELECTRIC RIDDLE

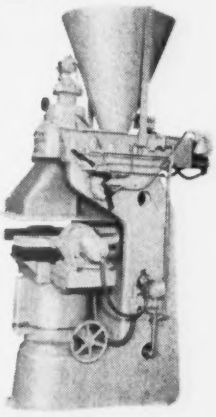
THERE'S A CHAMPION CORE BLOWER FOR EVERY TYPE OF FOUNDRY



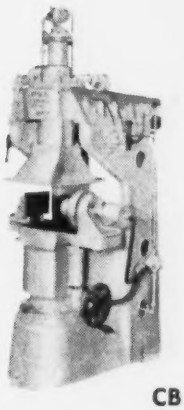
CB 400



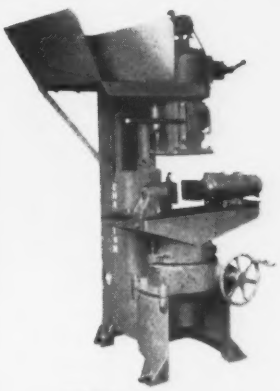
CB 18



CB 15



CB 12



CB 10

CB 5

FOREIGN REPRESENTATIVES . . .

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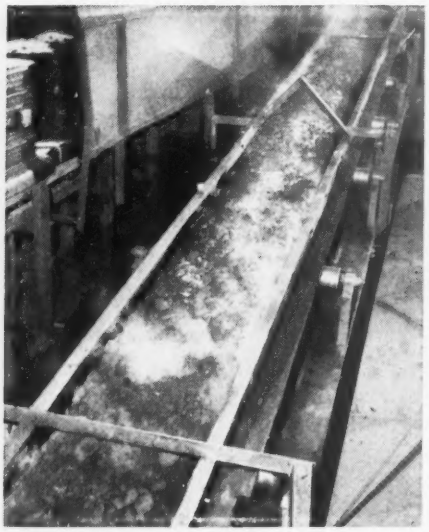
ARGENTINA, URUGUAY,
W. F. Guth Industrial Equipment & Furnace Co.,
Avenida R. S. Penna 852, Buenos Aires R-26

BRAZIL,
W. F. Guth Foundry Engineering, Caixa Postal 1411, Sao Paulo

CHILE,
Mauricio Hochschild & Cia, Ltd., Cassilla 153 D, Santiago, Chile

NASH MOTORS

found the right belt 6 years ago



■ Over six years ago Nash Motors of Kenosha, Wisconsin installed an Imperial Belt on this conveyor handling hot sand, scrap and rods from two motor-block shakeout units. The belt selected for this rough service was an 8-ply Standard Sahara, 265 ft. long and 30 in. wide.

Because of the way it withstands the gruelling punishment to which this Standard Sahara Belt is subjected, Nash is completely satisfied with its performance just as they have been with the service of many other belts of Imperial manufacture in over 26 years of continuous patronage.

Special impregnation and asbestos insulation give Sahara Belting its high heat resistance. Base fabric is heavy 37½-ounce silver duck, double-stitched with interlocking stitches to withstand abrasion and positively prevent ply separation. *Standard Sahara* handles materials up to 300° F., *Insulated Sahara* up to 450°F., *Super-Insulated* Sahara up to 600° F.

Mail for prices and complete data

Name.....

Company.....

Address.....

City & State.....

Imperial

BELTING CO.

1755 S. Kilbourn Ave., Chicago 23, Ill.

With the EDITORS

RELAXING: Press schedules have no respect for vacations. Therefore this department is being written the week-end following Labor Day, with the return to Cleveland and the office only a matter of hours away. This vacation, spent at Wing Haven, a new "sanctuary for birds, wildflowers and people" located in the woods of Steuben county, a short distance north of Angola, Ind., on U. S. 27, has been most enjoyable and restful. Wing Haven, with its center lodge and dining facilities, and its beautiful cabins located on the shores of Gentian Lake, was built during the past year and is owned and operated by Ben F. Swenson, for many years the manager of Potawatomi Inn in Pokagon State Park, just a short distance away. The vacation provided much in the way of rest, and the blue gill fishing was excellent. We certainly hope you had as much enjoyment on your 1951 vacation.

—o—

Back to Realities: Sitting on the shore of the lake in such a peaceful setting, with the birds providing the music of the woods, it was almost possible to forget the problems of the world. But an occasional newspaper and the radio brought reports of the breakdown of peace talks, the renewal of fighting in the Pacific, the efforts of the Russians to scuttle the Japanese peace treaty, and our own problems at home. All of this emphasizes the fact that foundrymen may find it increasingly difficult to carry on normal operations in the year ahead. Reports emphasize the ever increasing shortage of metallics, a situation which hits foundrymen right where it hurts.

—o—

Vocational Training: A recent interesting and most attractive 48-page booklet entitled "This Is Vocational Education in the Chicago Public Schools" devotes a page to the attention given foundries by the Chicago System. It is pointed out that "since founding is one of the basic industries of the city, students in the Chicago Public Schools should have an opportunity to become familiar with foundry operations." Congratulations to Herold C. Hunt, general superintendent of schools, and to the members of the school board for the attention being given vocational education, and to Hobart H. Sommers, assistant superintendent in charge of vocational education, for the excellence of this presentation.

—o—

Good Advice: At a time when the daily news seems to indicate our civilization is honeycombed with crime and corruption, the following advice seemed so excellent and worthwhile that we are passing it along. The item appeared in a recent issue of *Penton Progress,* a weekly news report for employees of the Penton Publishing Co., publisher of FOUNDRY. While the editorial was not signed, no confidence is being broken in reporting that it was written by Earl L. Shaner, chairman of the board of the Penton company, and editor-in-chief of our sister publication, STEEL.

Don't Be Misled

There are times when many of us are reluctant to look at the morning paper because we assume beforehand that a goodly portion of the news will be sordid and distasteful. After a daily diet of graft in Washington, atrocities by gangsters, basketball scandals, 5 per centers, corruption of police in many large cities, the Kefauver revelations, RFC blunders and lastly the alleged cheating at West Point, the average person is tempted to resign himself to a feeling of frustration. Why try to do the right thing when so many are cutting corners?

The flaw in this reasoning is that we are unduly swayed by the publicity that attends crime and misbehavior. For every person who gets into the public print because of wrongdoing there are tens of thousands who withstand modern day temptations and who live according to a high code of honor. No headlines herald their behavior.

Therefore, take the present wave of sordid news with a grain of salt. Humanity is not going to hell in a basket this year, next year or in the near future. Admittedly the emotionalism of these trying times is exacting its toll of human error. But remember that increasing numbers of people are blazing new trails of sacrifice, accomplishment and ethics.

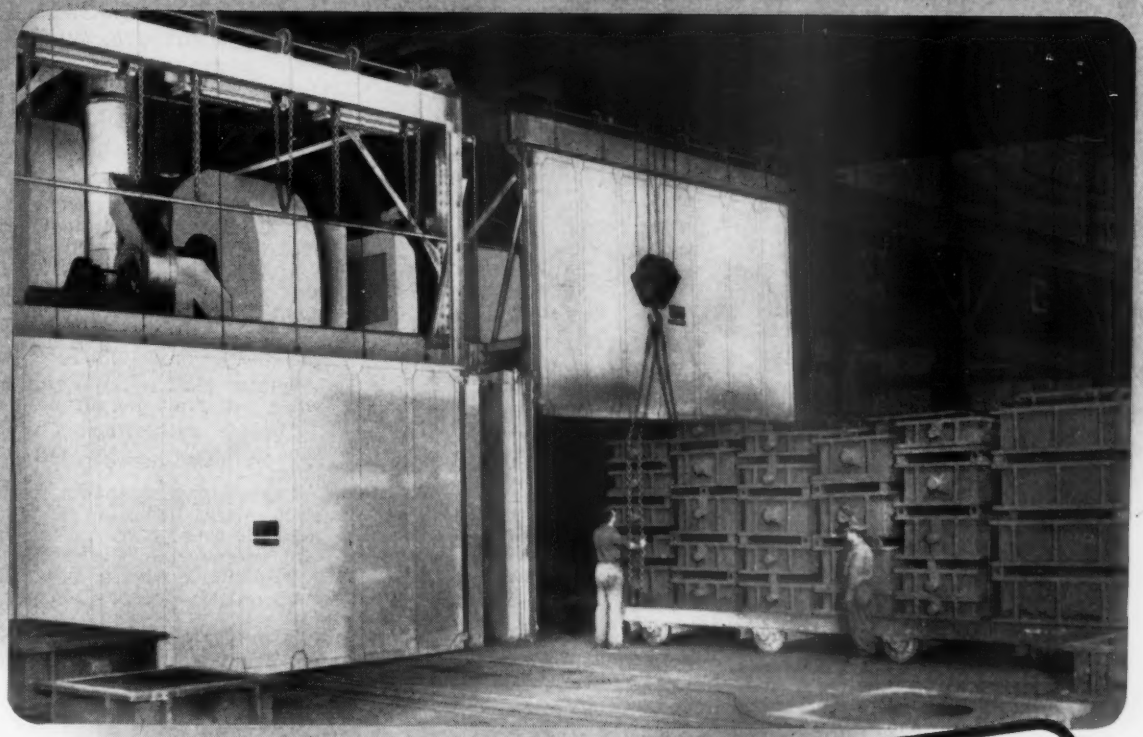
Don't be misled by the hysteria of the moment. Play for the reward that comes from conscientious service.

—o—

Sorry: We want to apologize to Ray Moore of the Claude B. Schneible Co., author of "The Studebaker Story" now appearing serially in FOUNDRY, for omission of his name on the second installment in the September issue. A few years ago we

(*Concluded on page* 12)

for perfect mold drying
COLEMAN OVENS



Coleman Car Type Mold Ovens in foundry of large engine manufacturer

● **Coleman Car Type Mold Ovens dry molds with the speed and uniformity required for increased production of quality, true-to-pattern castings in dry sand. Perfect drying eliminates mold and casting scrappage, saves valuable materials, time, and manpower.**

Coleman Car Type Core Ovens, for large, heavy core work, are the acknowledged leaders in dependable, economical performance... used by leading foundries in every class of heavy castings production.

Coleman Oven Cars are equipped with specially designed roller bearings to carry maximum loads under the severe conditions of foundry oven service. Motorized car haulage equipment can be furnished. Write for Bulletin 48

Only COLEMAN OVENS offer all these advantages:

- **PERFECT DRYING AND BAKING** eliminate manpower and casting losses due to make-overs and rejects.
- **INCREASED PRODUCTION** by making the most efficient use of skilled and unskilled labor.
- **HEAVY DUTY CONSTRUCTION.** Responsible for dependable performance, economical operation, and minimum maintenance cost.
- **GREATEST SAVINGS IN FUEL** by using the most economical fuel available.
- **MOST ECONOMICAL CORE BINDERS** for your particular casting requirements, oil or resin, can be used.

A COMPLETE RANGE OF TYPES:
COLEMAN OVENS are built in a complete range of sizes and capacities for every core-baking and mold drying requirement: Tower Ovens, Horizontal Conveyor Ovens, Car-Type Ovens, Transrack Ovens, Rolling Drawer Ovens, Portable Core Ovens, Portable Mold Dryers, etc.

THE FOUNDRY EQUIPMENT COMPANY

1831 COLUMBUS ROAD — CLEVELAND 13, OHIO

FEMA

WORLD'S OLDEST AND LARGEST FOUNDRY OVEN SPECIALISTS

GOOD NEWS for the grinding department

SIMONDS ABRASIVE CO.

Grinding Wheels

Production up! That's the bulletin board's big news... good news that started when Simonds Abrasive Company wheels went to work in the grinding department. Simonds complete line includes wheels accurately specified for top results on *your* jobs . . . grinding wheels, mounted wheels and points, segments and abrasive grain . . . all made under complete quality control by Simonds Abrasive Company, a major manufacturer of grinding wheels for almost 60 years. Write for free data book and your distributor's name.

SIMONDS ABRASIVE CO., PHILADELPHIA 37, PA. BRANCH WAREHOUSES: CHICAGO, DETROIT, BOSTON
DISTRIBUTORS IN PRINCIPAL CITIES

Division of Simonds Saw and Steel Co., Fitchburg, Mass. Other Simonds Companies: Simonds Steel Mills, Lockport, N. Y., Simonds Canada Saw Co., Ltd., Montreal, Que. and Simonds Canada Abrasive Co., Ltd. Arvida, Que.

(*Concluded from page* 10)

would have blamed this on gremlins, but now we will have to admit that a mental lapse occurred someplace along the editorial department-printing department trail. We feel that this series constitutes one of the best studies of the facilities and operation of a modern production foundry and that Ray deserves much credit for his work.

—o—

More Gobbledygook: Last month we gave you some of the double talk that accompanies the Washington defense efforts. Here is some more of the same:

Referred for appropriate action: Maybe your office knows what to do with this

Set for hearing: We hope nobody will show up so we can throw it out

Will advise in due course: If we ever figure it out, we'll let you know

To give someone the picture: A long confused and inaccurate statement to a newcomer

Problem area: Same boundaries as the District of Columbia

Quota: Half as much as you need when you can't get all you want

Topside authorities: The guys on the first row of the organizational chart

Carbon paper: A thin flexible substance, the invention of which has multiplied the scope of the executive and bureaucratic world many fold

Preliminary draft: A directive issued quickly before Congress repeals the act

A directive: A government order of uncertain intent issued on unreliable authority

A survey is being made on this: We need more time to think of an answer

Further substantiating data necessary: We've lost your stuff. Send it in again

To explore the problem: Don't be impatient. We'll think of something

Confidential memorandum: There wasn't time to mimeograph this

Top secret: We may be wrong about this so don't circulate it

Government policy: A vague but effective hiding place

Note and initial: Let's spread the responsibility for this

Give us the benefit of your present thinking: We'll listen to what you have to say as long as it doesn't interfere with what we've already decided to do

Referred to a higher authority: Pigeonholed in a more sumptuous office

—o—

Cover Comments: Last month's cover, which showed a micrograph of sulphide inclusions in cast steel, resulted in numerous comments concerning its interesting and attractive features. Of course, we had a few pointed questions, such as "What is par on the golf course shown on the cover;" and "What flooded river was shown in aerial view on the September cover." But we think Art Director Cadot had a good idea for that cover, and that it turned out quite well.

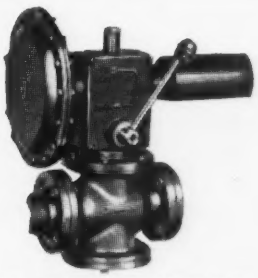
F.G.S.

why it will pay you to STOP at booth G162

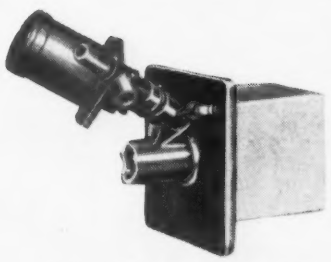
in the american gas ass'n section of the METAL SHOW

October 15 to 19 ... State Fair Grounds ... Detroit

McKee Eclipse



McKee-Eclipse LOCK-TITE Safety Valve—heads a line of advanced Gas Heating controls.



McKee-Eclipse Piloted Wall-Tite Burners — One of a complete range of Burners for every type of application.

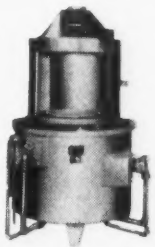
benefit by the greatest selection

Eclipse offers the most complete line of Gas-Fired Industrial Heating Equipment on the market. This wide choice means we have exactly the right gas-heating unit for your particular application, or can design it for you.

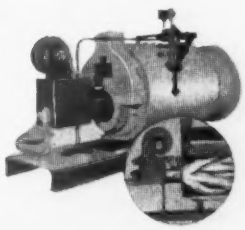
profit by Eclipse 43 Years' Experience

Learn "What's New" by seeing McKee-Eclipse, one of the oldest Industrial Gas Appliance Designers and Builders; Pioneers since 1908, in originating and producing advanced designs for the industrial use of Gas. Let us apply our diversified experience to solving some of your gas-heating problems. Come in and visit with us at Booth G162, American Gas Ass'n Section.

A few of the McKee-Eclipse Products:



McKee Salt Pot Furnace — From an extensive selection of heat-treating and melting furnaces.



McKee Supermatic Scotch Steam-boilerplant—Typical of large line of Vertical or Horizontal Steam Boilers.

Y5688

Ask for free new combustion equipment bulletin or refer to Sweet's Product Designers or Process Industries Catalog

Representatives in All Principal Cities

Eclipse Fuel Engineering Company
725 South Main Street, Rockford, Illinois

McKee Eclipse

THE MOST COMPLETE LINE OF GAS-FIRED INDUSTRIAL EQUIPMENT ON THE MARKET

let the experience of these
4 foundries help you
increase production
and cut costs!
1
EPHRATA MANUFACTURING COMPANY
MANUFACTURERS OF
EMCO
Quality Light and Medium Gray Iron Castings - Machine Work
EPHRATA, PENNA.
National Engineering Co.
549 West Washington Blvd.
Chicago 6, Illinois
Gentlemen: attention: Mr. W. G. Pardonner
Referring to your letter of June 29 with reference to our Simpson Porto-Muller purchased from you some time ago, wish to advise that we are entirely satisfied with the performance of this equipment.
We are pleased to state that we have been able to reduce our losses on certain castings with the sand prepared by this machine and at the same time increased our production as well as produced smoother castings.
Should we have any problem in connection with this machine, you may be sure that we will contact Mr. Troy on same.
Yours very truly,
EPHRATA MANUFACTURING COMPANY
President
WMB/mgh
SIMPSON
Porto-Muller

2

PORT HURON BRASS FOUNDRY COMPANY

Bron. Aluminum and Magnesium Sand Castings
Machine Work

MARYSVILLE, MICHIGAN

National Engineering Co.,
Chicago, Ill.

Attention, Mr. A. I. Hurd

Gentlemen:

We have been using your Porto-Muller for several months now and are highly pleased with its performance. We are saving at least 50% on labor and 25 to 50% on core oil, depending upon our mixture and also getting smooth and better cores. Also find a big saving in time on our core knock-out operation.

In our opinion, the machine has justified your claims as to its performance.

Yours very truly,
PORT HURON BRASS FOUNDRY CO.

AD:W

3

UNITED IRON WORKS COMPANY
Engineers Founders Manufacturers

PITTSBURG-KANSAS

National Engineering Company
549 West Washington Blvd.
Chicago, Illinois

Attention: Mr. A. I. Hurd

Gentlemen:

Wish to advise you that we are well pleased with the performance of our Simpson Porto-Muller which we installed some six months ago.

It has resulted in a saving of about 50% of labor cost on mixing core sand. We have also reduced binder and core oil about 50%.

Wish to thank you for the very good service your Mr. Kane has given us in showing our foundry boys the best way to use the Muller.

Yours truly,
UNITED IRON WORKS COMPANY
W. G. BURNSIDE
Superintendent

4

BRUMUND FOUNDRY
BRASS, BRONZE and ALUMINUM CASTINGS
4408-12 CARROLL AVENUE
CHICAGO 24, ILL.

National Engineering Company
549 W. Washington Blvd.
Chicago, Illinois

Gentlemen:

We wish to commend you for the fine piece of equipment you have in the Porto-Muller. We previously mixed our core sand by hand and the introduction of the Porto-Muller has therefore resulted in quite a saving. Where it would take two men two hours to mix five wheelbarrows of sand it now takes one man about forty-five minutes. Besides this saving we use about one half the amount of oil and water and obtain better results.

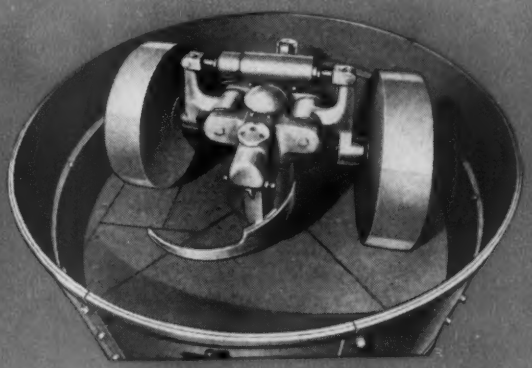
Thanking you for all the cooperation you have given, we remain

Yours sincerely,
BRUMUND FOUNDRY

READ what these experienced foundrymen write about Simpson Porto-Mullers—how one *"has saved 50% of labor cost on mixing core sand"*—how another is *"able to reduce losses on certain castings"* and another *"reduced amount of core oil and binder about 50%."*

Apply these actual production experiences to your own foundry operation and see how easily many variable costs can be reduced without an elaborate installation of new equipment. The Porto-Muller is completely self-contained and portable. The 300 lb. capacity mixer with spring-adjusted mullers, and the 3 H.P. motor are compactly mounted on pneumatic tires for easier handling. Simply roll up to the sand—load—start mulling. What could be more efficient?

For full particulars about Simpson Porto-Mullers and their application in your foundry—*write for Bulletin 492.*



Simpson Porto-Mullers, like the new larger capacity Simpson 2F and 3F Simpson Mix-Mullers, use comparatively light mullers with adjustable spring pressure to provide exactly the right mulling pressure for the specific type of sand being conditioned. Because of the design of the plows, and the muller suspension, the sand is subjected to violent agitation, and is considerably increased in volume.

SIMPSON *Intensive* MIX-MULLERS

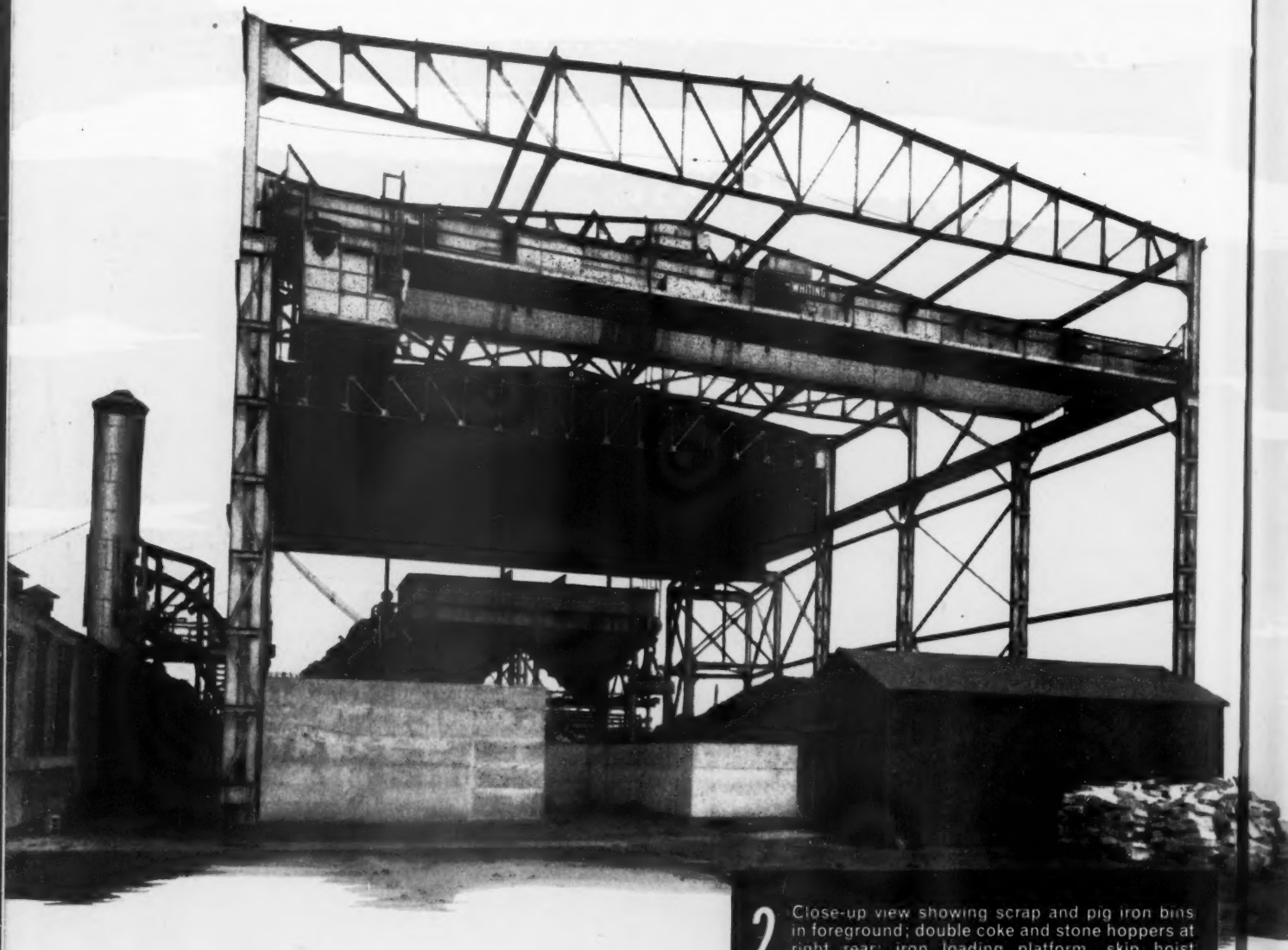
NATIONAL *Engineering Company*

608 Machinery Hall Bldg. • Chicago 6, Illinois

Manufacturers and Selling Agents: For Continental European Countries — George Fisher, Ltd., Schaffhausen, Switzerland; for British Possessions — August's Limited, Halifax, England; for Canada — Dominion Engineering Co., Ltd., Montreal; for Australia and New Zealand — Gibson, Battle & Co., Pty., Ltd., Sydney, for Argentina, Brazil and Uruguay — E quipamentos Industriais EISA Ltda., Sao Paulo, Brazil; for Mexico — CASCO S. De R.L., Mexico, D.F.

KEEN FOUNDRY CO.

Increases Output...Saves Manhours wit

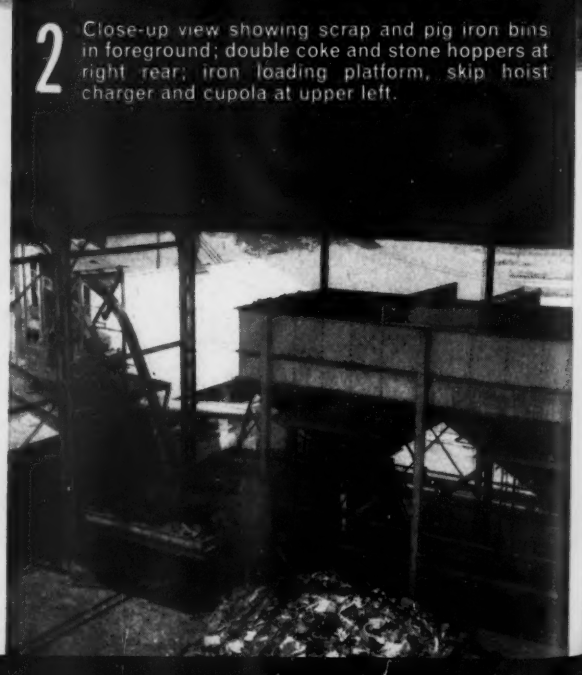


1 **Materials handling efficiency from railway car to cupola! At Keen Foundry Co., Griffith, Ind., a 7½-ton crane with grab bucket unloads and stores coke and limestone.**

This same crane, equipped with magnet, unloads and handles pig iron and scrap from storage bins in the yard to the weigh hopper on the make-up platform. Proper amounts of each iron component are accurately weighed and iron charges are dropped into a cone-bottom bucket below the platform. At the same time, coke and stone charges are made up to exact proportion in a motorized traveling weigh lorry which receives the material by gravity feed from overhead storage bins nearby.

The traveling lorry drops the coke and stone on top of the iron charge in the bucket. By push-button control, the operator raises the loaded bucket up the inclined runway to the charging door, where the entire charge is released slowly and the empty bucket is automatically returned to the loading position. And so the cycle continues, with only three men: one on the crane, one on the make-up platform, and one tending the cupola.

2 Close-up view showing scrap and pig iron bins in foreground; double coke and stone hoppers at right rear; iron loading platform, skip hoist charger and cupola at upper left.



WHITING

CHARGING AND MELTING EQUIPMENT

HERE ARE THE ACTUAL RESULTS OF MECHANICAL CHARGING AT KEEN FOUNDRY!

Formerly, with hand charging and a 9 to 11 ton per hour cupola, 128 to 144 manhours per day were required for charging, cupola operation and clean-up.

Today, with this Whiting mechanized system and a large cupola (16 to 20 tons per hour), only 24 manhours per day are required. *The daily melt has been practically doubled and over 120 manhours per day are saved!*

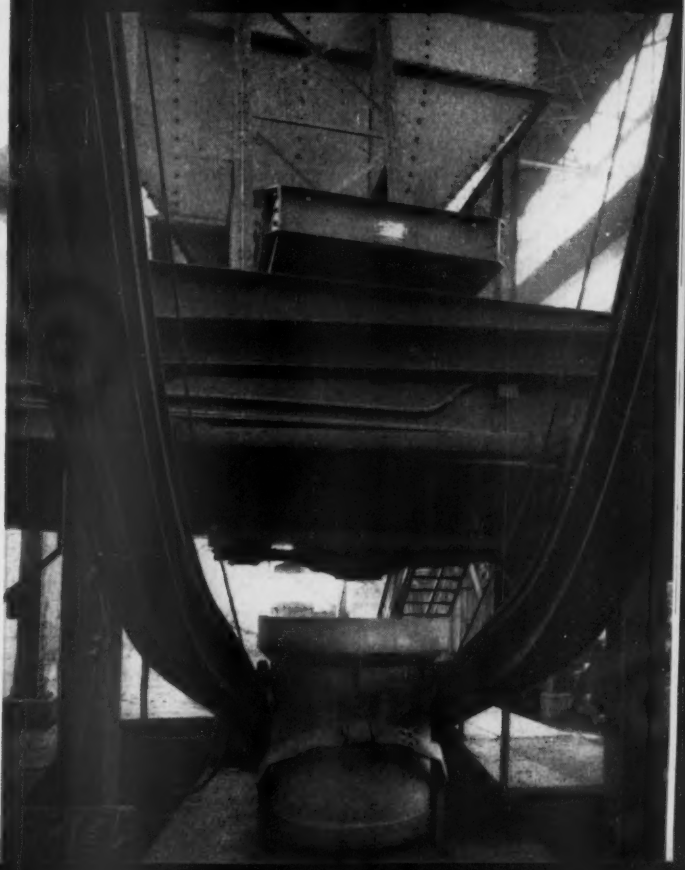
You can cut costs and save manpower with better charging and cupola operation! Write today for Bulletin No. FY-153 and FY-100.

WHITING CORPORATION
15607 Lathrop Ave., Harvey, Illinois

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

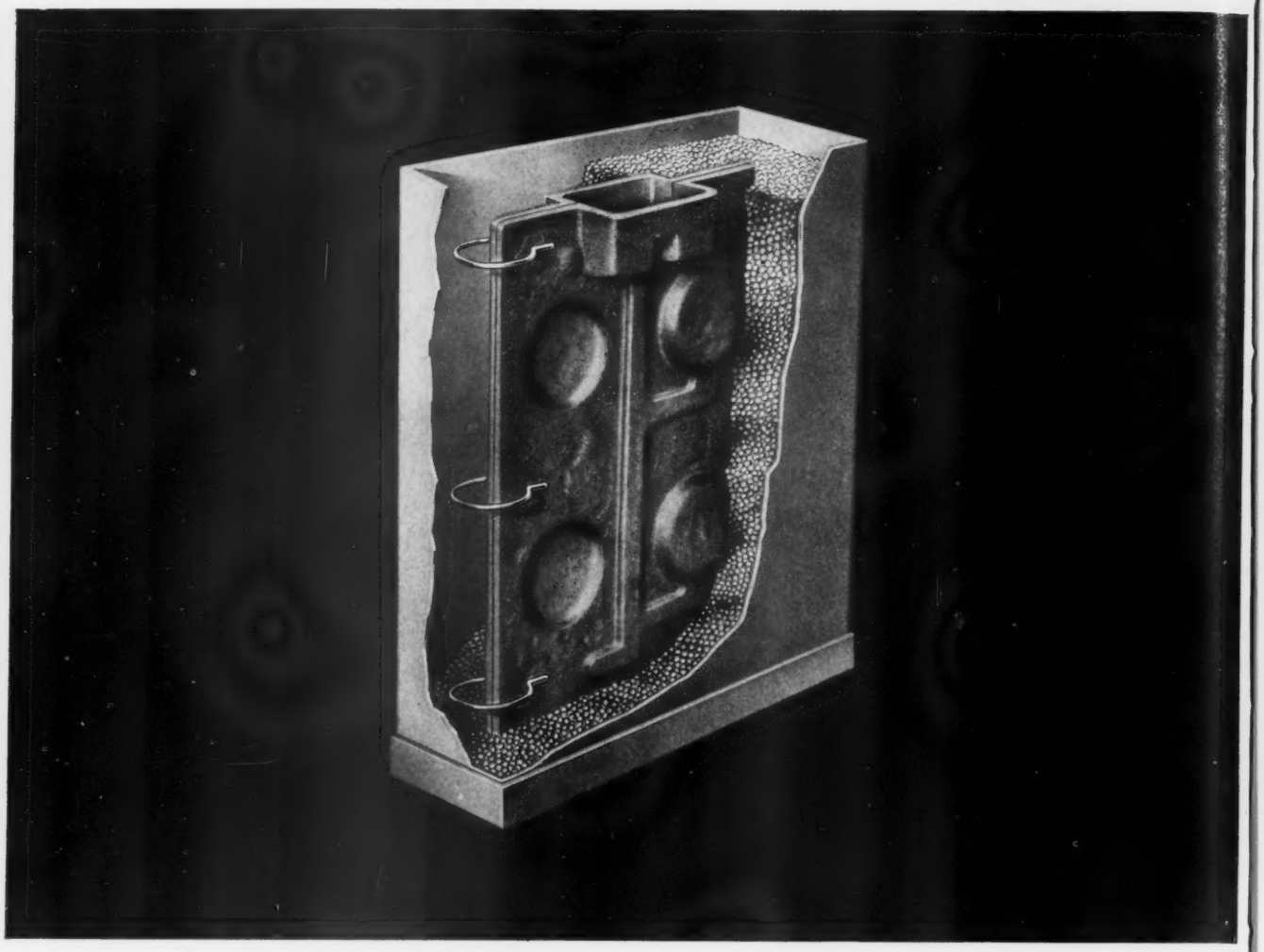
3 The hydraulically controlled Whiting full-cone-bottom bucket (specially developed for skip type chargers) returning empty to loading position under make-up platform. The uniform, symmetrical loading accomplished with this type of bucket assures the most desirable charge distribution and the most efficient operation of the cupola.

4 Lower end of the Whiting skip hoist charger showing the cone-bottom bucket positioned directly under the weigh hopper of the make-up platform, ready to receive the next charge.



the WHITING Foundry Line

Cupolas • Cupola Spark Suppressors • Cupola Hot Blast Equipment • Cupola Moisture Control Equipment • Cupola Charging Systems • Cupola Coke Igniters • Cradle Furnaces • Converters (Steel) • Duplex Melting Systems • Air Furnaces • Electric Melting Furnaces • Ladles • Ladle Handlers • Wet-type Dust Suppressors • Tumbling Mills • Annealing Ovens and Cars • Pulverizers • Pulverized Coal Firing Systems • Turntables • Materials Handling Equipment: Trackmobile • Trambeam Overhead Handling Systems • Electric Chain Hoists • Overhead Cranes



5 STAR SAVER

Time Saver, Sand Saver, Scrap Saver, Space Saver, Money Saver

This is a sample sand mold produced by the shell molding process for making thin-shell molds and cores bonded with BAKELITE Phenolic Resins. The process not only yields better castings, but a greater number of castings per ton of metal poured.

It makes ferrous or non-ferrous castings with tolerances as close as .002 to .005 of an inch per inch. The fine-grain sands used give virtually pattern-smooth surfaces, minimizing finishing time and costs, and conserving metal.

Molds and cores are of uniform quality, highly porous, permitting escape of gases; strong, moisture-resistant and stable, with long storage life. Built-in dowel pins and holes assure accurate registration of the mold parts as the metal is poured.

Ninety per cent less sand is required, with important savings both in floor space and handling. And the process lends itself readily to mechanization resulting in more economical foundry operations.

For information about BAKELITE Phenolic Resins for the shell molding process, use the attached coupon.

Dept. CO-29, BAKELITE COMPANY,
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street, New York 17, N. Y.

Please mail at once my free copy of the booklet, "BAKELITE Phenolic Resins for the Croning Process."

*Name*_____ *Title*_____

*Company*_____

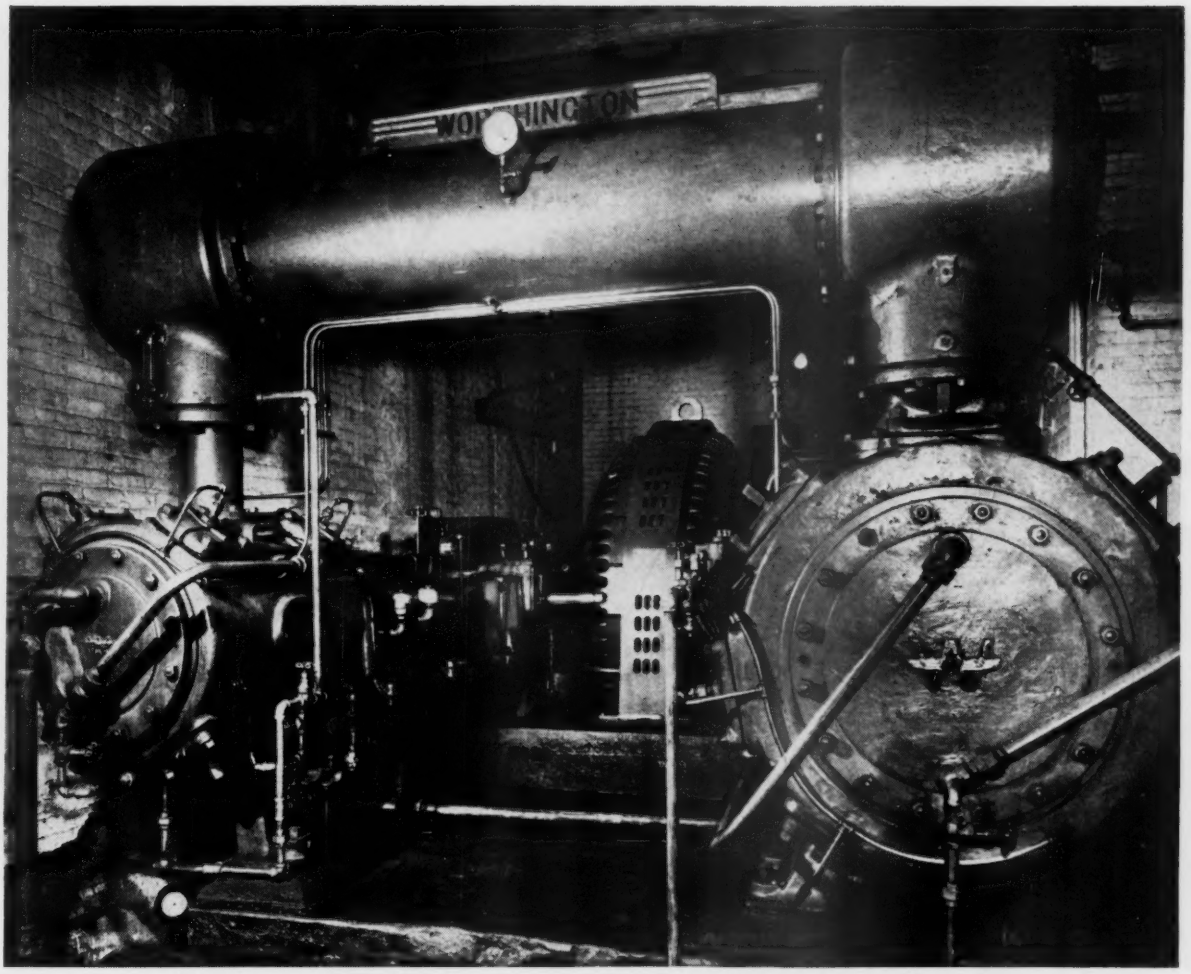
*Street*_____

*City*_____ *State*_____

BAKELITE
TRADE-MARK
PHENOLIC
BONDING RESINS

TRADE MARK

BAKELITE COMPANY
A Division of
Union Carbide and Carbon Corporation
30 East 42nd Street, New York 17, N. Y.



Worthington DC-2 horizontal air compressor at Lynchburg Foundry Co., Lynchburg, Va.

It Saves Power Costs At Every Load

When Lynchburg Foundry Co. wanted additional compressed air capacity . . . more than its Worthington Y-type compressor could handle . . . a Worthington DC-2 was chosen.

With this duplex compressor, Lynchburg gets lowest-cost compressed air and longest compressor life.

LESS DEMAND ON MOTOR WHEN THERE'S LESS DEMAND FOR AIR

Five-step capacity control permits matching the pumping rate to the varying amounts of air required. This reduces power consumption at partial load.

Worthington's five-step capacity control governor is exceptionally sensitive because it performs *only pilot duty*. The actual unloading is done electrically and pneumatically. But the pumping rate is continuously under the *control* of the governor. With decrease or increase in demand, the governor causes the compressor to unload or reload in sequence.

Worthington's by-pass control also reduces operating temperatures, eliminating valve difficulties from carbon deposits, improving lubrication, and reducing cylinder wear.

Other features include Worthington's famous Feather* Valve (lightest, tightest, most efficient ever made) . . . and a high-efficiency intercooler which needs less water, less power, less attention.

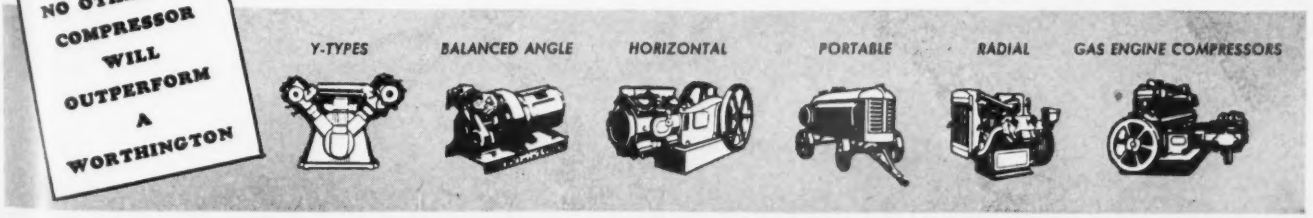
For more proof *there's more worth in Worthington*, write for Bulletin L-675-B1B to Worthington Pump and Machinery Corporation, Compressor Division, Buffalo 5, New York.

WORTHINGTON

NO OTHER AIR COMPRESSOR WILL OUTPERFORM A WORTHINGTON

*Reg. U. S. Pat. Off.

K.1.6



WHERE EFFICIENCY IS DEMANDED...

You Can't Beat

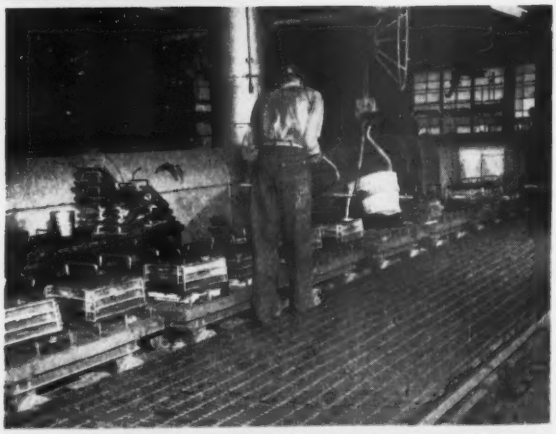
FREMONT

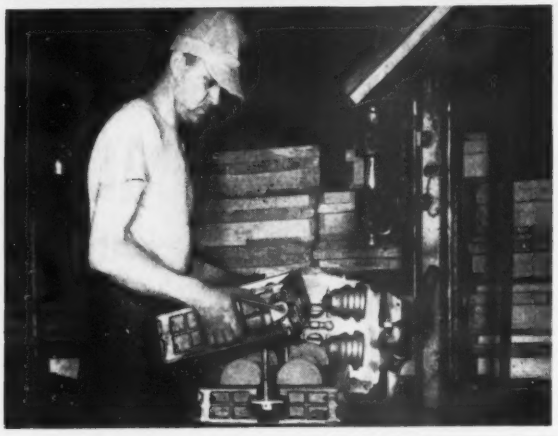
MAGNESIUM SLIP FLASKS

and

FREMONT

CAST IRON OR CAST ALUMINUM JACKETS





Shown are Fremont Flasks and Jackets in operation on the continuous pouring system at the completely mechanized foundry of The Ohio Brass Co., Mansfield, Ohio.

Weighing 1/3 less than aluminum, Fremont Magnesium Slip Flasks are easier to handle. With twice the tensile strength of aluminum, and solid bolted and welded corner construction they withstand long, continuous usage in machine molding. Inside surfaces and flanges are accurately machined. Top and bottom hinges are steel faced. The one-inch GROOVLOCK FOOLPROOF PIN (particularly adapted to cope or drag pattern jobs) guarantees perfect alignment indefinitely. Other types of standard pin fittings are also available. Fremont Flasks may be assembled on 3°, 4° or 5° taper.

Fremont Jackets are favored everywhere because of the money they save. The precision machined and drilled bolted corner construction permits easy insertion of new sides or ends. The entire jacket need not be scrapped. The standard style is for ordinary foundry practice and the grooved style, which permits ready gas escape, is for steel foundries. Assembled on 3°, 4° or 5° taper.

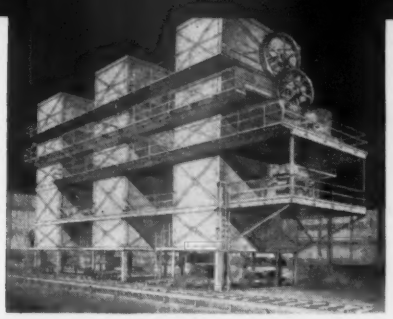
Write today for literature.

The Fremont FLASK CO. FREMONT, OHIO

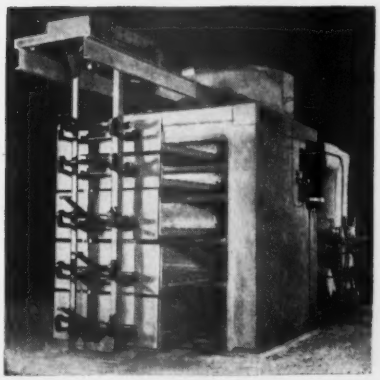
Many

OF THE OUTSTANDING CORE AND MOLD OVEN INSTALLATIONS SHOW PREFERANCE FOR ENGINEERING *by*

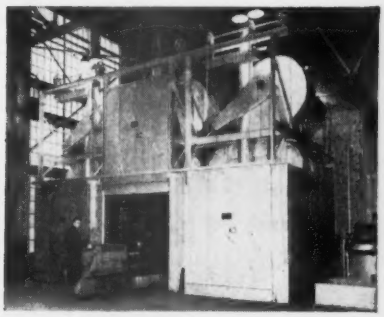
CARL-MAYER



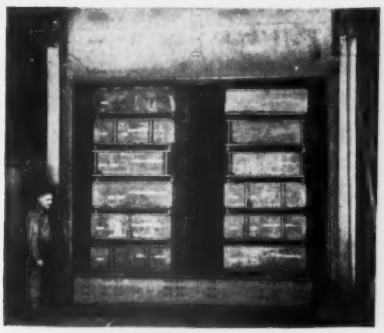
VERTICAL CORE OVENS
at General Steel Castings Co.



ROLLING DRAWER CORE OVEN
at Aluminum Co. of America



RACK TYPE CORE OVENS
at Aluminum Co. of America



CAR TYPE MOLD OVEN
at Oil Well Supply Co.

OUR CUSTOMERS

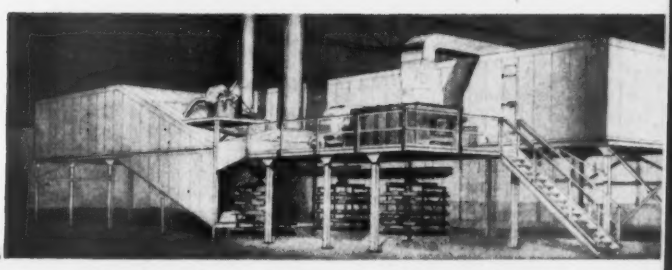
Important concerns like these:

Aluminum Co. of America
American Brake Shoe Co.
American Radiator Co.
Blaw-Knox Co.
Brown Industries
Buick Motor Div. of General Motors Corp.
Bucyrus-Erie Co.
Cadillac Motor Div. of General Motors Corp.
Columbia Steel Corp. (U.S. Steel Corp.)
Crucible Steel Castings Co.
Dunkirk Radiator Co.
Eclipse Aviation Division of Bendix Aviation Corp.
Electric Autolite Co.
Ford Motor Co.
Fremont Foundry Co.
General Electric Co.
General Motors Corp. and Subsidiaries.
Gilbert & Barker Co.
General Steel Castings Co.
Golden Foundry Co., Inc.
Henry Kaiser Corp.
W. O. Larson Foundry Co.
Mesta Machine Co.
F. E. Meyers & Bro. Co.
Oil Well Supply Co. (U. S. Steel Corp.)
Packard Motor Car Co.
H. B. Salter Co.
Shenango Penn Mold Co.
Standard Foundry Co.
Union Brass & Metal Mfg. Co.
Union Steel Castings Co.
West Steel Castings Co.
A. C. Williams Co.
Whiten Machine Works
Whiting Corp.

In Carl-Mayer design, there is a vivid picture of unusual achievements in operating speed, efficiency and fuel economy.

Write for Bulletins No. 141 and 350

ALSO OTHER TYPES OF INDUSTRIAL OVENS AND FURNACES



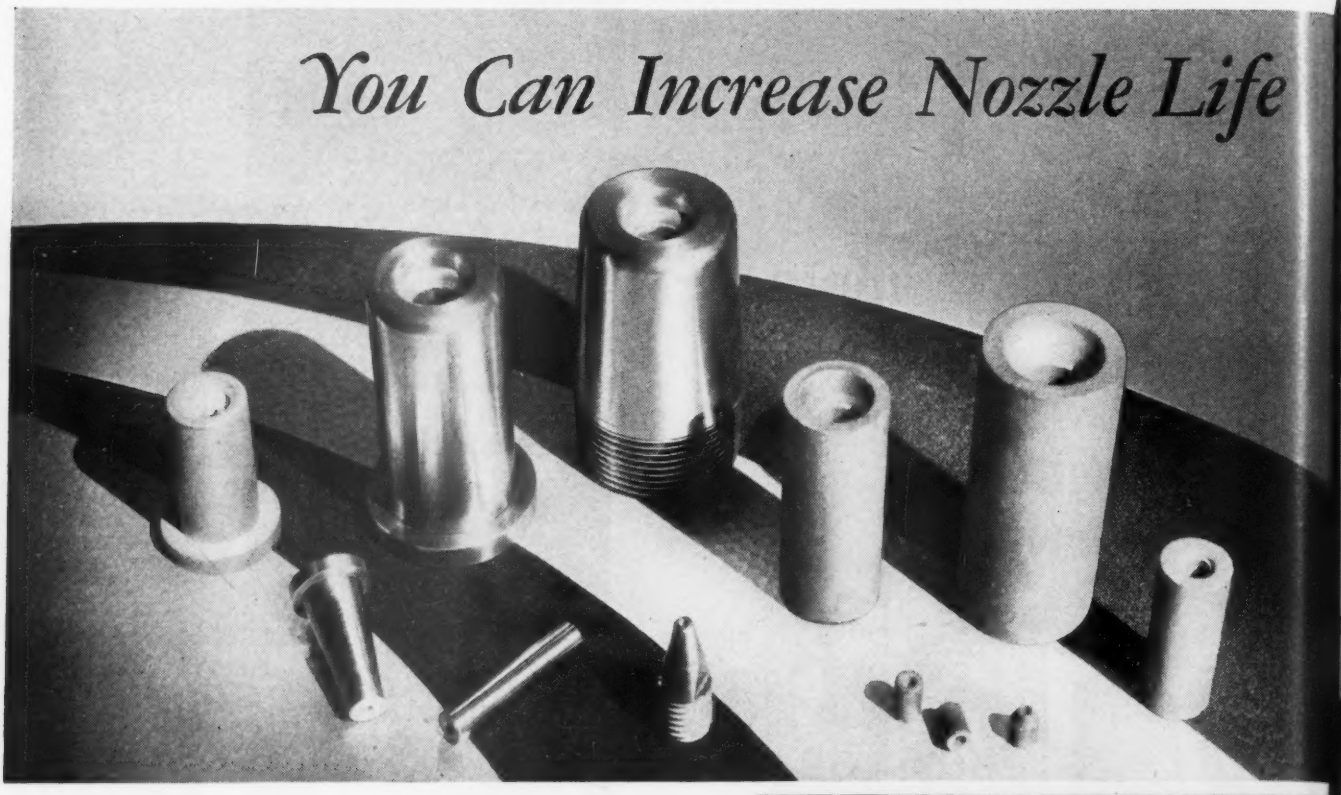
HORIZONTAL MONORAIL CORE OVEN at Eclipse Aviation Co.

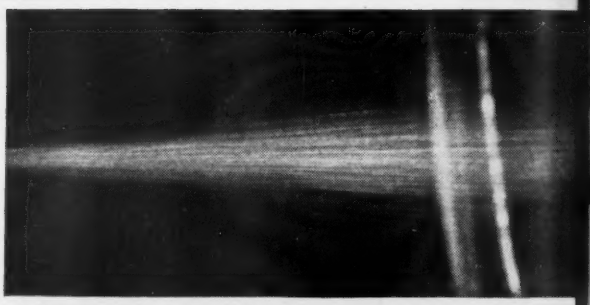
THE CARL-MAYER CORPORATION

3030 Euclid Avenue • Cleveland, Ohio

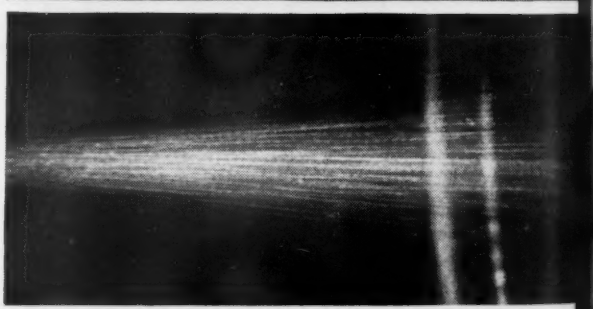
BACKED BY REPUTATION AND OVER 30 YEARS' EXPERIENCE

You Can Increase Nozzle Life

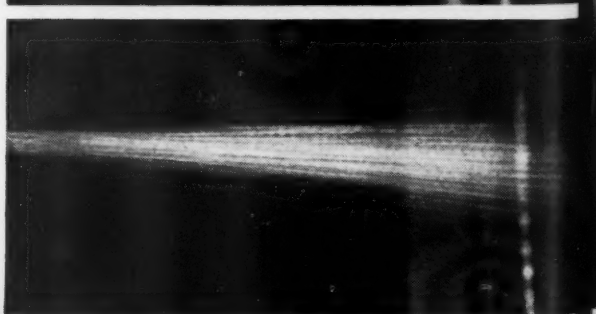




High speed photograph of stream from new iron nozzle — note that stream concentration and abrasive velocity and volume are fair.

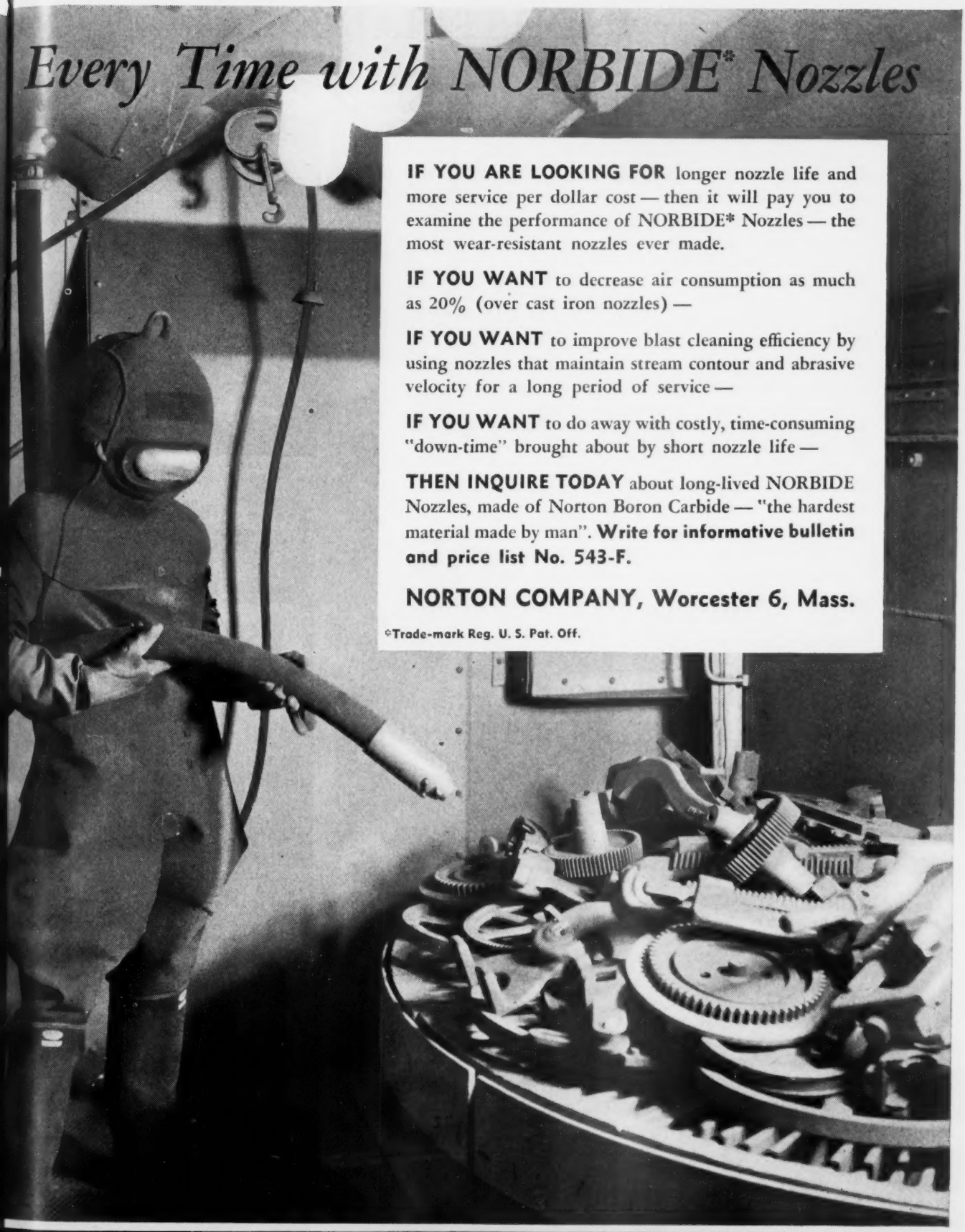


Stream from the same nozzle after three hours with silica sand. Outlet opening worn to twice original size — stream concentration poor, abrasive velocity and volume low.



Stream from Norbide Nozzle after 404 hours with sand — outlet diameter worn only 0.032"—hundreds of hours of useful life remain—marked stream concentration—high abrasive velocity and volume.

NORTON WEAR-RESISTANT PRODUCTS


Every Time with NORBIDE* Nozzles
IF YOU ARE LOOKING FOR longer nozzle life and more service per dollar cost — then it will pay you to examine the performance of NORBIDE* Nozzles — the most wear-resistant nozzles ever made.
IF YOU WANT to decrease air consumption as much as 20% (over cast iron nozzles) —
IF YOU WANT to improve blast cleaning efficiency by using nozzles that maintain stream contour and abrasive velocity for a long period of service —
IF YOU WANT to do away with costly, time-consuming "down-time" brought about by short nozzle life —
THEN INQUIRE TODAY about long-lived NORBIDE Nozzles, made of Norton Boron Carbide — "the hardest material made by man". Write for informative bulletin and price list No. 543-F.
NORTON COMPANY, Worcester 6, Mass.
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To meet every INDUSTRIAL X-RAY NEED

There's no need to improvise or compromise when you buy a General Electric Industrial X-Ray Unit. The comprehensive GE line makes possible the selection of just the right unit to match the type of inspection desired throughout your manufacturing process.

More than a half century of x-ray development, including the pioneering of industrial x-ray apparatus, is reflected in this highly versatile array of industrial x-ray units. Chances are, there's a need for x-ray in your business. Lower your production costs and improve quality. Let one of General Electric's highly-trained application specialists appraise your inspection needs. For full information write — X-Ray Department, General Electric Company, Milwaukee 14, Wisconsin, Box YY-10.

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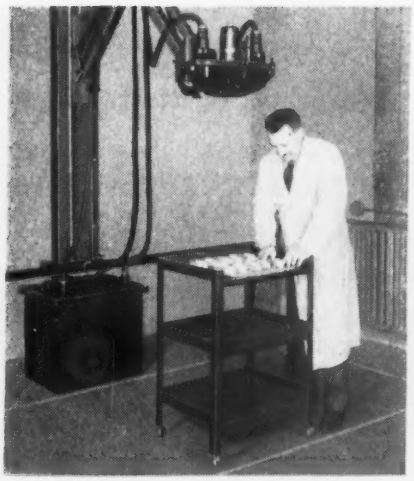
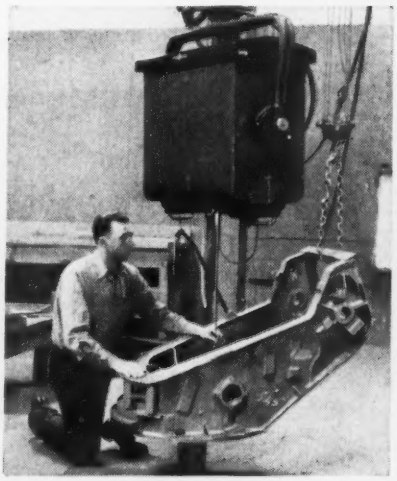
GENERAL ELECTRIC

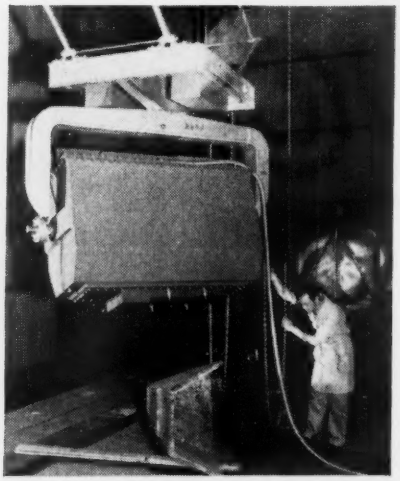
XRD-3—This x-ray diffraction apparatus provides for the use of modern techniques for the study of crystal structures and the relation of these structures to the physical properties of nearly all solid materials.



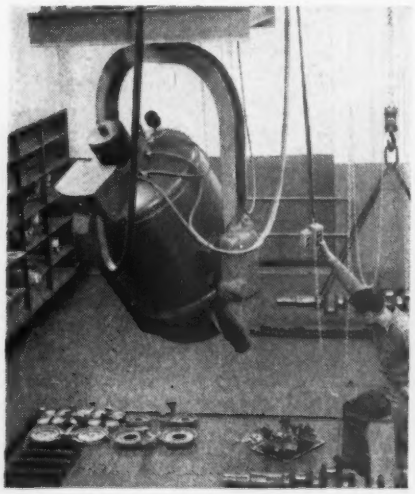
OX-140 — Extremely versatile and efficient . . . with a continuous operating range of from 30 to 140 kvp at 5 to 10 ma. Available in six different models. Invaluable for inspection of low-density metal and other materials.



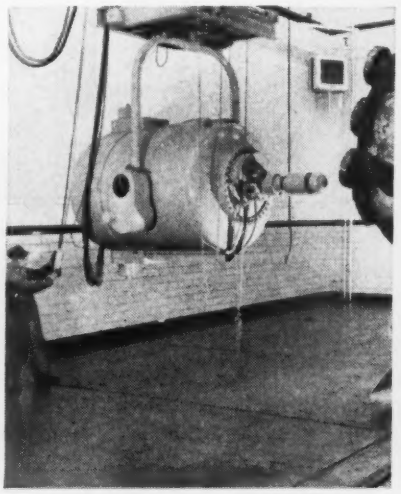
OX-250 — The world's most popular industrial x-ray unit . . . with an operating range from 60 to 250 kvp, 2.0 to 10.0 ma. This rugged unit is available in seven different mountings to meet varied industrial needs.



OX-400 — Bridges the gap between low and high-voltage equipment. Where cost prevents installation of higher-voltage equipment, yet penetration of lower-voltage units is insufficient, this 400 kvp apparatus is a natural choice.

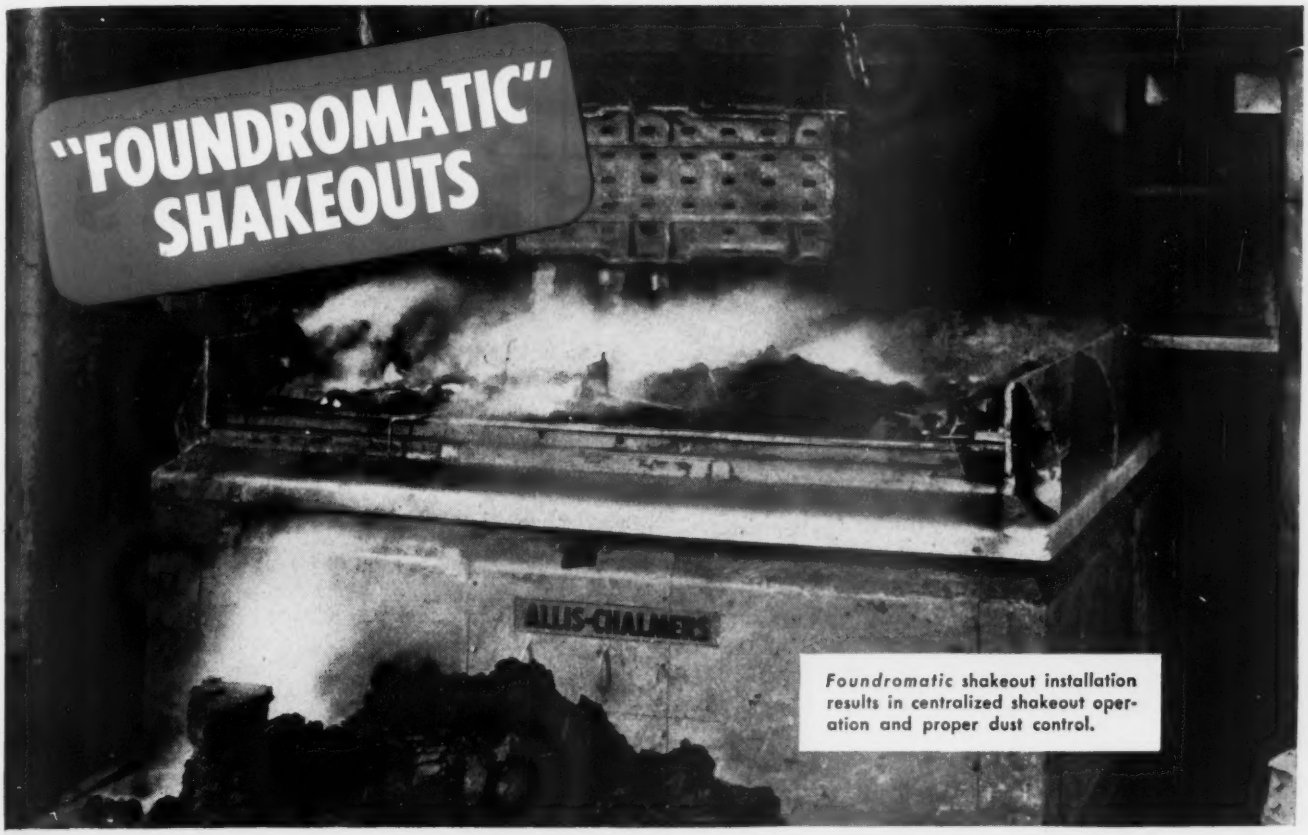


RESOTRON 1000 — The million-volt unit which opened a new era in industrial radiography. Featuring a resonant transformer, multi-section tube, and gas insulation, it operates at 1000 kvp, 3.0 ma, continuous rating.



RESOTRON 2000 — As with the Resotron 1000, this two-million volt unit permits the use of the large-field, reflected x-ray beam for simultaneous radiography of many objects in a single exposure . . . Faster, with greater penetrating power.

15 MILLION-VOLT BETATRON — The present-day ultimate where maximum sensitivity is paramount. Your best choice in magnetic accelerators, for speed, sensitivity, and field size for the radiography of heavy-section thicknesses.



Foundromatic shakeout installation results in centralized shakeout operation and proper dust control.

Clean Up Your Foundry!

With old shakeout methods, valuable floor space was used for molding sand and no dust control was possible. Alloy steel casting seen here being dumped directly onto the foundry floor.

IMPROVED WORKING CONDITIONS resulted when a *Foundromatic* shakeout was installed at this large western foundry. (Company name will be furnished upon request.)

Look at the photo in the column at left, showing a flask being shaken out by the old method formerly used at this foundry. Compare it with the photo above, showing the same operation on the 8 x 10 ft, 25 ton capacity *Foundromatic* shakeout at this foundry.

The company is so satisfied they also have installed *Foundromatic* shakeouts at their Chicago Heights, Denver and St. Louis foundries. Is *your* foundry still using slow, dusty methods of shaking out flasks? Consider the improved working conditions and other benefits a *Foundromatic* shakeout installation will bring:

INCREASED OUTPUT — Shakeout can break up molds as soon as castings c re cool, leaving floor area free for reuse. Better working conditions improve efficiency.

LOWER COST — Man-hours for shakeout or core knockout operations are radically reduced, using the same *Foundromatic* shakeout. Flask maintenance minimized. Heavy duty stress-relieved body, with oversize bearings in vibrating mechanism, gives long service. Hourly cost of operation is low.

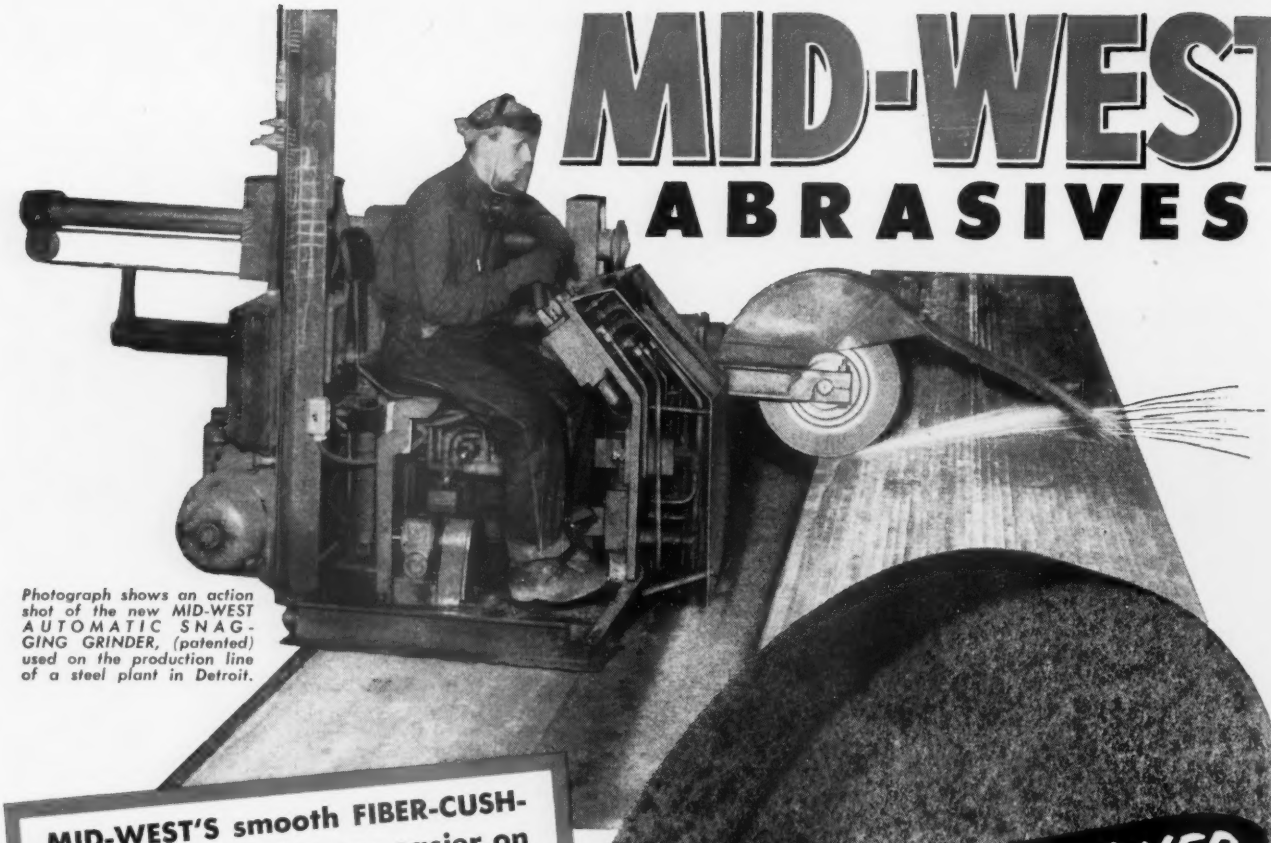
Foundromatic shakeout single units range in capacity from one ton to 25 tons . . . multiple units available for over 100 tons. Call your nearest A-C sales office for information, or write to Allis-Chalmers, Milwaukee 1, Wis. for Bulletins 07B7532, up to 5,000 lb, or 07B6365A, up to 25 tons. A-3394

ALLIS-CHALMERS

Foundromatic and *Regulex* are Allis-Chalmers trademarks.

Foundry Equipment for Bigger Output-Better Working Conditions!

MID-WEST ABRASIVES



Photograph shows an action shot of the new MID-WEST AUTOMATIC SNAGGING GRINDER, (patented) used on the production line of a steel plant in Detroit.

MID-WEST'S smooth FIBER-CUSHIONED arbor holes are easier on • your OPERATOR • your GRINDING WHEEL • your MACHINE SPINDLE and BEARINGS • your WORK-PIECE • your PRODUCTION • your GRINDING COSTS.

Not only will Mid-West FIBER-CUSHIONED resinoid snagging wheels minimize the troubles so characteristic of snagging operations, but they're easier to mount, they're stronger, and they last longer.

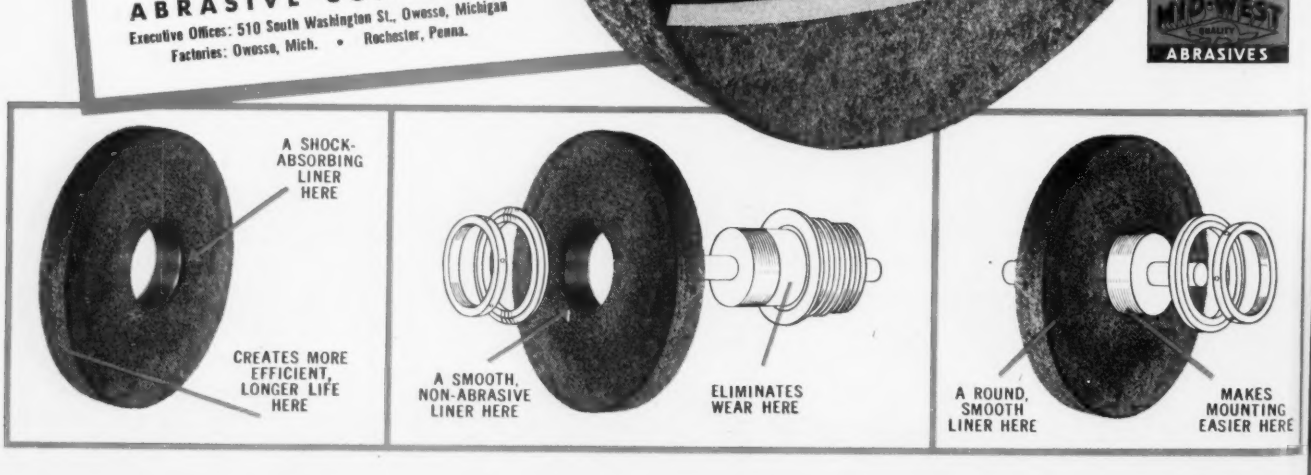
The fiber-cushioned centers (a Mid-West Development) plus Mid-West's special resinoid bond, an extremely cool cutting bond, assures a highly satisfactory wheel life and increased production.

For complete information on these Fiber-Cushioned snagging wheels, write, wire or phone today.

MID-WEST ABRASIVE COMPANY

Executive Offices: 510 South Washington St., Owosso, Michigan
Factories: Owosso, Mich. • Rochester, Penna.

MID-WEST QUALITY ABRASIVES


A SHOCK-ABSORBING LINER HERE
CREATES MORE EFFICIENT, LONGER LIFE HERE
A SMOOTH, NON-ABRASIVE LINER HERE
ELIMINATES WEAR HERE
A ROUND, SMOOTH LINER HERE
MAKES MOUNTING EASIER HERE

Core handling is safer and cheaper overhead!

A Zig-Zag Conveyor in a large plumbing supply foundry. Baked cores are transferred direct from ovens to conveyor for movements to checking benches, eliminating "heavy" lifting and moving by women employees.

with R-W "Zig-Zag"® Continuous Power Conveyor

Fragile cores can't take it! And costs go skyrocketing when a sudden bump or jerk in handling destroys part of a day's production. But you don't need to worry about breakage when your cores are carried overhead—smoothly and in perfect safety—on a ZIG-ZAG Continuous Power Conveyor.

ZIG-ZAG operates just like "water through a pipe"—it's a steel tube-like track through which travels a specially constructed motor-driven chain carrying unit loads up to 125 pounds at speeds ranging from 1 inch to 60 feet per minute. And it's highly flexible too—if changes or relocation are required, you can take it down here and put it up there, and in most cases *use all the parts!*

★ ★ ★

Learn how patented ZIG-ZAG can save money in your core department. Send for details—or better yet, have an R-W engineer consult with you at no obligation.

Engineered for Economy and Flexibility

- Horizontal and vertical units alternate in a continuous chain traveling through special steel tubing.
- Complete flexibility for installation in any plant. Easily installed, easily changeable to conform to plant alterations.
- SAFE—all moving parts are fully enclosed.
- Low first costs. Low Power Factor.
- Standard horizontal or vertical curves —two-foot radius.

Richards-Wilcox Mfg. Co.

"A HANGER FOR ANY DOOR THAT SLIDES"

AURORA, ILLINOIS, U.S.A. *Branches in all principal cities*

SLIDING DOOR HANGERS & TRACK • FIRE DOORS & FIXTURES • GARAGE DOORS & EQUIPMENT
INDUSTRIAL CONVEYORS & CRANES • SCHOOL WARDROBES & PARTITIONS
ELEVATOR DOOR OPERATING EQUIPMENT

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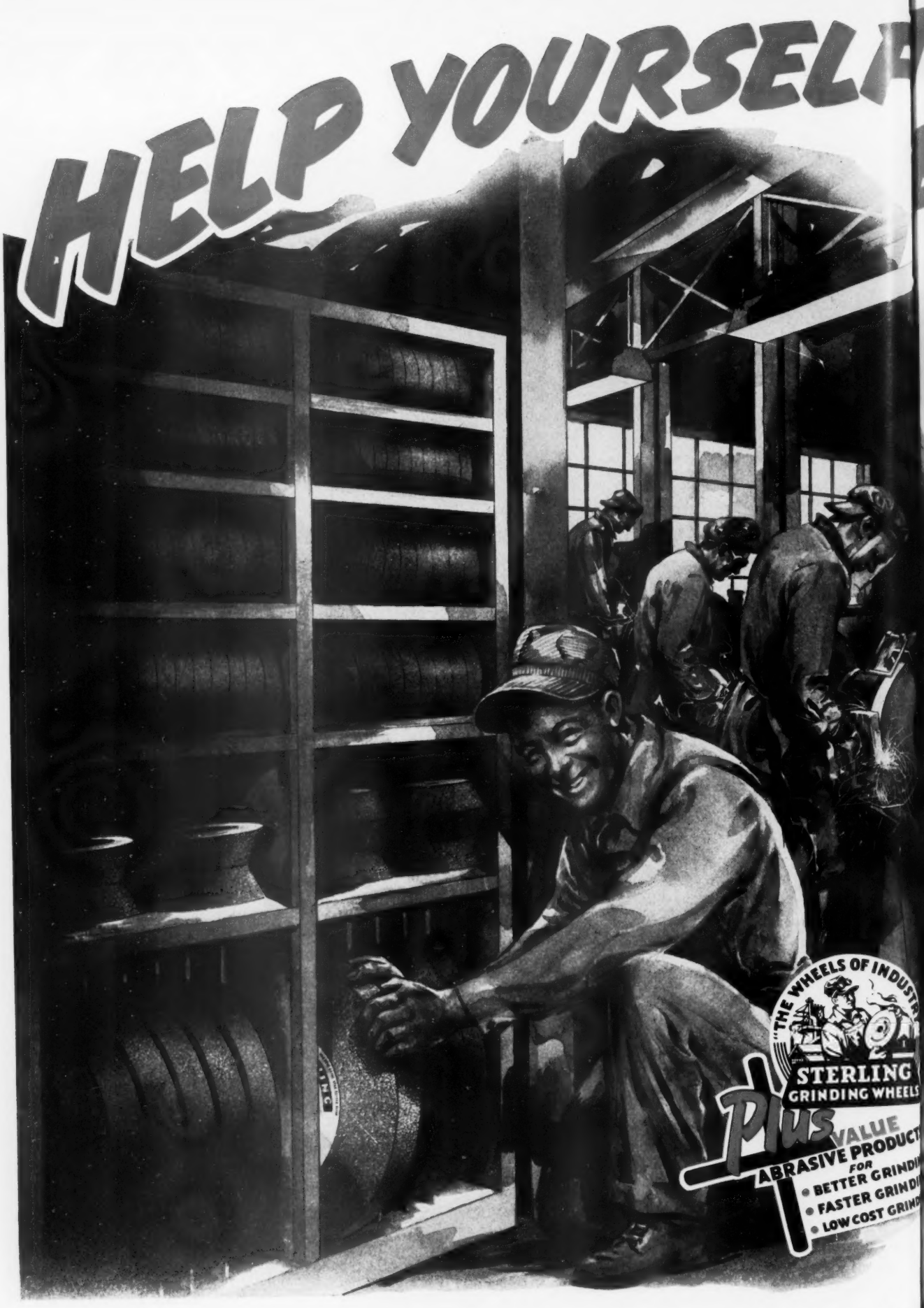
OVER 71 YEARS



THE STERLING GRINDIN

TO FASTER, BETTER GRINDING

Sterling's VITRIFIED 22 BOND WIDENS THE APPLICATION OF MANY WHEEL SPECIFICATIONS FOR ALL TYPES OF LOW-SPEED, STEEL & MALLEABLE CASTING GRINDING

The recent introduction of Sterling's New 22 Vitrified Bond has made possible an unusual series of low-speed grinding wheels that withstand the hard knocks of severe operations on all types of steel and malleable castings. You can obtain these recently introduced abrasive units that guarantee longer service regardless of unusual operating heat and pressure...wheels that stand up and produce more regardless of tougher than usual grinding conditions.

Sterling's New 22 Vitrified Bond makes possible the application of many important, additional specifications to the demands of your steel and malleable casting grinding problems. Through the use of this recently developed bond, Sterling offers the best possible grinding, whether the wheels be small units for portable grinding or large-diameter wheels for snagging operations.

Sterling's Low-Speed Grinding Wheels, fortified with the New 22 Vitirified Bond, can readily be applied to the solution of many of your grinding problems. Our engineers will welcome the opportunity of working closely with you to eliminate all troublesome job details. Ask us today about the New 22 Bond and how it will make difficult grinding easy. There is no obligation...your letter or telegram will bring quick results.

BEST IN THE TEST --- THAT'S STERLING

Among many tests carried out in leading foundries everywhere, results indicate the superiority of the "Wheels of Industry". For example, on one job, a Sterling 24x2x2 wheel, XA164 R7 V22 OB, outperformed all other units. Used for snagging the gates and fins of steel casting tubes, it had a much better cutting action...provided less wheel wear per ton of material. Consistent grinding made these test wheels first choice. Similar results can be yours...may we make a test in your foundry...help you do better, faster grinding?

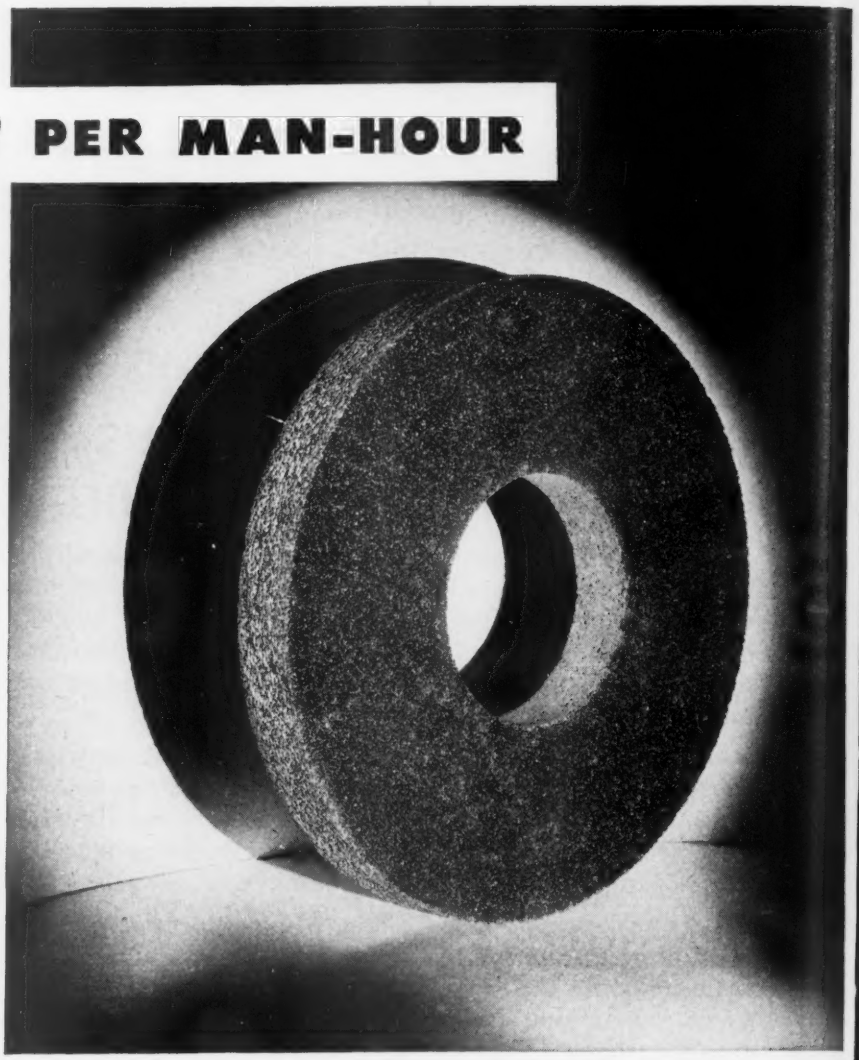
Ask for These STERLING Research and Development Folders - - -

Various grinding wheel specifications for different types of tools and metals are outlined in these interesting Sterling Research and Development folders which are available upon request. Ask for your copies which will include the popular "Art of Science and Grinding". No obligation. Write and your set of folders will be mailed right away.

WHEEL DIVISION TIFFIN OHIO

GRINDING WHEEL INSTITUTE MEMBER

MORE OUTPUT PER MAN-HOUR



MANHATTAN SNAGGING WHEELS

You get the most metal removed at the lowest cost with Manhattan Snagging Wheels. They are custom tailored for the problems in your plant.

Type of abrasive, grain size, hardness, structure, and bond are all formulated to a "prescription" for the precise snagging wheel your castings require. This protects you on reorders. You get uniform quality, long life and more output per man-hour with Manhattan Snagging Wheels.

GRINDING WHEEL INSTITUTE MEMBER

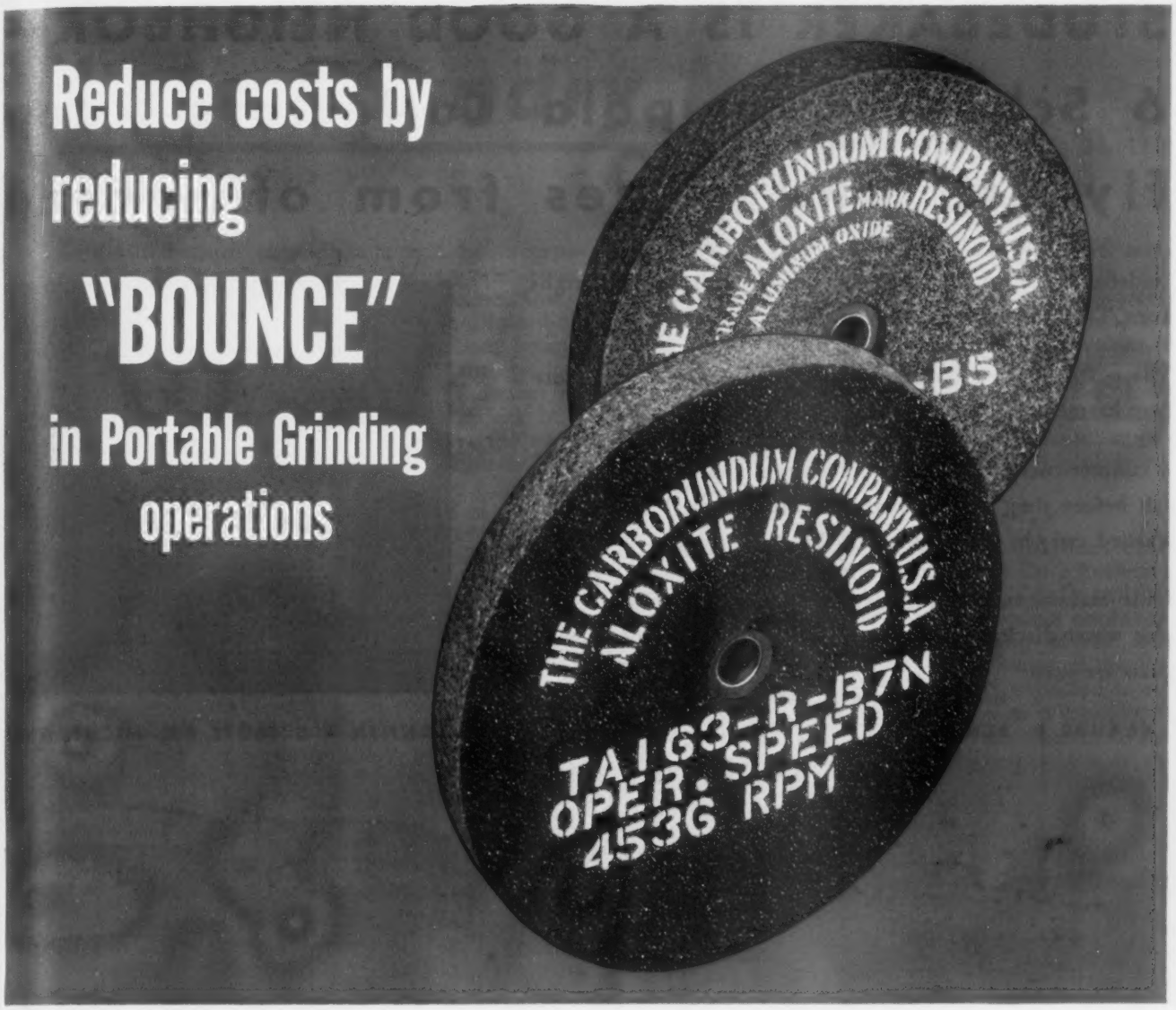
WRITE TO ABRASIVE WHEEL DEPARTMENT

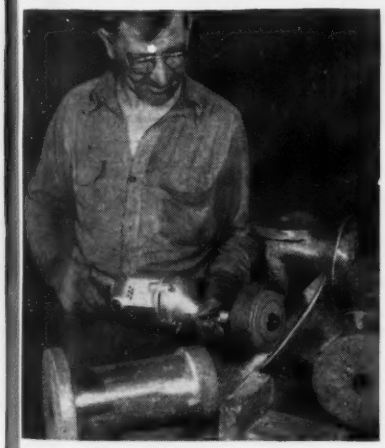
RM

MANHATTAN RUBBER DIVISION
RAYBESTOS-MANHATTAN, INC.
PASSAIC, N. J.

Mechanical Rubber Products • Rubber Covered Equipment • Abrasive and Diamond Wheels • Packings • Brake Linings
Brake Blocks • Clutch Facings • Radiator Hose • Fan Belts • Asbestos Textiles • Powdered Metal Products • Bowling Balls

Reduce costs by reducing "BOUNCE" in Portable Grinding operations





You can put more jobs over your portable grinding equipment at lower unit costs by using Resinoid bonded wheels equipped with *built-in rubber bushings*—a new and novel abrasive product by CARBORUNDUM.

B5 AND B7N RESINOID BOND WHEELS—with *built-in rubber bushing*—increase production by eliminating wheel "bounce." This means more wheel-to-work contact time—less strain on the operator—and improved finishes. Proper wheel mounting and performance are assured by a steel liner mounted within the rubber bushing and the rubber washers which are provided.

The Carborundum Company also manufacture a complete line of other standard abrasive tools and products for portable grinders including straight and flaring cups, Cones and Plugs and spindle mounted wheels.

A complete range of sizes, shapes, grain sizes, grades and bond types meets all the varied requirements of high stock removal or finish on hard-to-reach surfaces.

See your CARBORUNDUM salesman or distributor for details, or write Dept. F 81-30.

Only CARBORUNDUM

TRADE MARK

makes ALL Abrasive Products ...to give you the proper ONE

"Carborundum" and "Aloxite" are registered trademarks which indicate manufacture by The Carborundum Company, Niagara Falls, N.Y.

81-30R

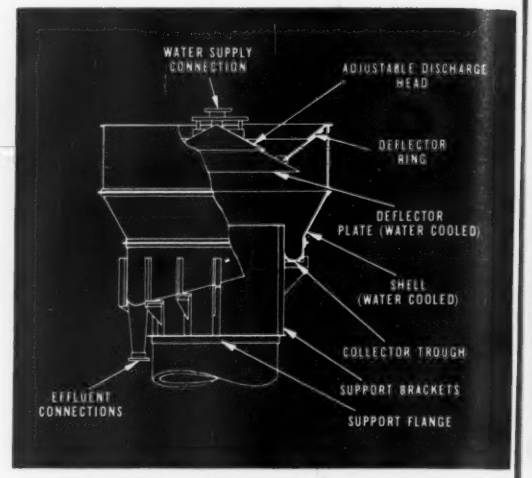
STUDEBAKER IS A GOOD NEIGHBOR--
6 Schneible Cupola Collectors keep fly-ash and fumes from offending

Studebaker's six cupolas emit no fly-ash to annoy their neighbors. The sulfur emission is reduced to a minimum.

These 6 sentinels are on guard against nuisance—little more than harmless steam is ever seen.

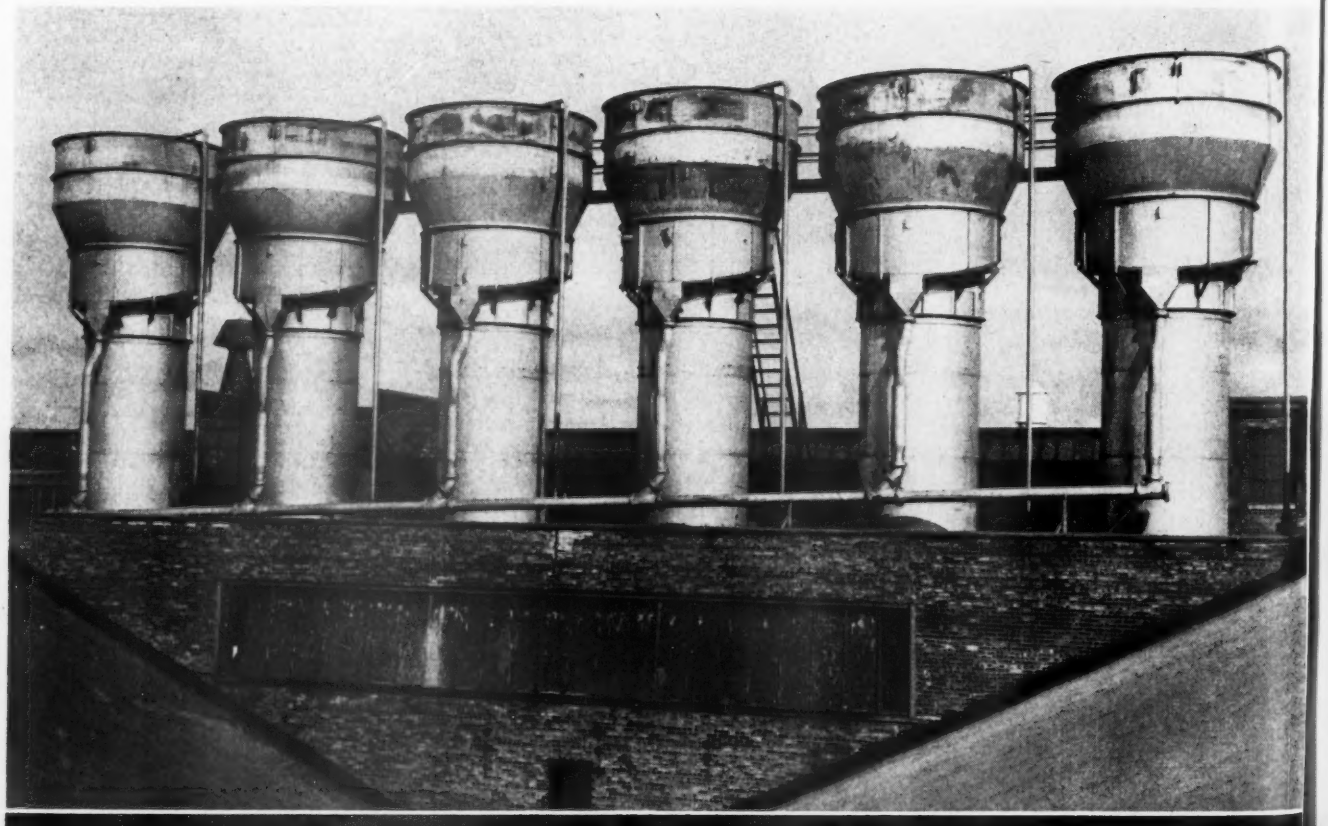
A counter-current curtain of water traps sulfur fumes and fly-ash before they can be objectionable Material collected is washed away to the settling tank by sluice.

Little maintenance or attention is required, patented adjustable water discharge heads are non-clogging and no moving parts are used.



Write for Bulletin 449 on Cupola Collectors

CLAUDE B. SCHNEIBLE CO. • P.O. BOX 502—ROOSEVELT ANNEX • DETROIT 32, MICHIGAN



SCHNEIBLE

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

Late Foundry News

SEPTEMBER 26, 1951

CPR-60: Several amendments will be incorporated in the foundry industry's ceiling price regulation (CPR-60) when it goes into effect Oct. 1 after a 30-day postponement from its original effective date. The regulation covers both ferrous and nonferrous castings, including sand, permanent mold and die castings. Possibly the most important amendment exempts small orders from the regulation. It is proposed to waive the regulation on any iron, steel, brass or bronze casting made in one month which has a total shipping weight for the quantity ordered of not over 250 pounds. The corresponding limit on aluminum and magnesium sand castings would be 100 pounds, and on die and permanent mold castings less than eight hours continuous production. A number of other amendments clarify the wording of provisions establishing the method of arriving at ceiling prices.

BRASS AND BRONZE INGOT: Increased use of copper and copper-base alloy scrap by direct consumers such as foundries is an important factor in the shortage of this material, according to the Brass and Bronze Ingot Makers Industry Advisory Committee to the NPA. It also blames unauthorized purchases of copper scrap for the situation which is said to have compelled a virtual shutdown of the industry. Ingot makers say that OPS ceiling prices put them at a disadvantage in competing for scrap.

COPPER CONTROL: Copper goes 100 per cent under CMP operation in the fourth quarter. After Oct. 1 foundries may not fill any orders for brass and bronze castings other than authorized controlled material (ACM) orders. This applies not only to unrated orders but to DO orders not converted by that date, but it does not prevent the customer from converting such orders into ACM orders where possible.

FIRST QUARTER ALLOTMENTS: Application form (CMP-4B) for first quarter allotments of steel, copper and aluminum under CMP should be filed by foundry equipment manufacturers by Oct. 1. The forms have been distributed from Washington but also are obtainable from NPA field offices. This form also should be used in filing a supplemental request for material in excess of that allotted for fourth quarter.

ALUMINUM: Additional primary aluminum capacity has gone into operation recently, and completion of other facilities is being pushed. Urgent needs for the aircraft program are a stimulus. While some hope is expressed at Washington of fairly early relief in the stringent supply situation, dry summer weather has affected power supply in certain areas, causing production at some primary aluminum plants to be behind schedule. Meanwhile, scrap remains short but OPS says it is not considering a general increase in ceiling prices to stimulate the flow. Secondary smelters claim their monthly scrap receipts have shrunk to 13 million pounds from an average of 30 million pounds last year. Pattern manufacturers were alloted only about 60 per cent of their indicated fourth quarter aluminum requirements; however, it is believed that supplemental applications will be filled if additional metal is required for defense work.

PERSONALS: Richard A. Flinn, assistant chief metallurgist, American Brake Shoe Co.'s Research and Development Center, later this year will become an associate professor of product engineering and metallurgical engineering at the University of Michigan and be in charge of the latter's experimental foundry. He is expected to retain connections with Brake Shoe as a consultant. . . . Nigel H. Bell has resigned as director of the NPA Aluminum and Magnesium Division to rejoin Sterling Windows Inc., New York, as sales vice president. Timothy A. Lynch, retired Reynolds Metals executive and deputy director of the division, is serving temporarily as acting director. . . . Frank H. Hanfelder, purchasing agent, American Steel Foundries, has been made a member of the Iron and Steel Scrap Consumers Industry Advisory Committee to NPA . . . Wallace B. Quail, Armco Steel Corp., Middletown, O., has succeeded Richard F. Sentner, U. S. Steel Corp., Pittsburgh, as director of the NPA Iron and Steel Division.

WATER METERS: NPA has told water meter manufacturers their fourth quarter allotments of brass and bronze castings will be about one-half those of third quarter. Reason given is that total national requirements for copper-base castings next quarter is estimated at 470 million pounds and estimated supply is 235 million. Actually, brass foundries have shipped at better than a 300-million-pound quarterly rate the first half this year.

FOREIGN SCRAP: Steps have been taken to acquire all Korean battlefield iron and steel scrap considered usable here. A government mission also is visiting other Pacific points in search of scrap, and will study the possibility of raising 197 sunken ships in the Marianas.

FOUNDRY FACILITIES: DPA has approved more than 200 rapid tax write-offs for new or expanded defense facilities since a 60-day moratorium on such action was imposed Aug. 18. The exceptions, made because the cases are regarded as urgent, include: Hartford Electric Steel Corp., Hartford, Conn.; Peerless Aluminum Foundry Co., Bridge-

port, Conn.; Ingersoll-Rand Co., Painted Post, N. Y.; Gartland Haswell Foundry Co., Sidney, O.; Chicago Hardware Foundry Co., North Chicago, Ill.; Atlantic Foundry Co., Akron; Sonith Pattern Works Inc., Indianapolis. Among cases approved just prior to the moratorium are: Bethlehem Foundry & Machine Co., Bethlehem, Pa., $253,000; Central Foundry Division, Saginaw, Mich., $1,380,500; K. W. Thompson Tool Co., Garden City Park, L. I., $18,296; Superior Foundry Inc., Cleveland, $809,254; Frank Foundries Corp., Moline, Ill., $30,000; H. E. Bremer Mfg. Co., $26,985; Koppers Co. Inc., Baltimore, $165,672.

AID FOR INDIA: Armour Research Foundation, Chicago, will map out a program for expanding small scale industries in India with special attention to improving practice in the many small foundries in that country. Contract for this work was placed by the Office of International Trade, and represents one of the first contracts for export of industrial know-how under the Point Four program of the State Department's Technical Cooperation Administration.

RECORD COKE OUTPUT: An all-time peak of about 80 million tons is expected to be reached in coke production this year. This would be 10 per cent over 1950 and 7 per cent ahead of the previous record set in 1948. Beehive coke output the first half this year, 33,837,986 tons, was the highest since 1942. Oven coke production the first six months totaled 35,493,179 tons.

FREIGHT CAR SHORTAGE: The fall pick-up in freight traffic likely will intensify the present shortage of approximately 20,000 cars a day. Building of new cars is being pushed but is hampered by material shortages. Shippers are urged to make the most efficient use of cars possible and move them promptly to help relieve the pinch.

MISCELLANY: Interlake Iron Corp. will spend $14 million expanding blast furnace capacity at Chicago and Erie, Pa. This will raise its annual pig iron producing capacity 23 per cent to 1,620,000 tons and increase the company's plant expenditures since 1948 to about $34 million . . . Riverside Foundry Inc., Bettendorf, Iowa, has received DPA approval of a $615,000 loan for plant improvements and additions . . . Controlling interest in the Warren Pipe & Foundry Corp., Phillipsburg, N. J., and Everett, Mass., has been acquired by Solomon E. Shahmoon, a member of the New York Stock Exchange . . . Domestic graphite, properly sized, has been substituted successfully for Madagascar flake graphite in making crucible, says the Salvage and Reclamation Division, NPA. . . . The Navy is offering what foundry capacity it has open to firms unable to obtain castings elsewhere for completion of urgent defense contracts.

PRICES OF FOUNDRY METALS AND COKE

(As of Sept. 26, 1951)

FOUNDRY COKE

(Per net ton, f.o.b. ovens)

BEEHIVE	
Connellsville	$17.00-18.00
New River	21.30
Wise County	15.95
OVEN	
Birmingham	$20.30
Chicago	23.00
Detroit	24.00
Erie, Pa.	23.50
Everett, Mass.	24.80
Indianapolis	22.75
Kearney, N. J.	22.75
Milwaukee	23.75
Painesville, O.	24.00
Philadelphia	22.70
Neville Island (Pittsburgh)	23.00
Portsmouth, O.	22.50
St. Louis (Delivered)	25.40
Swedeland, Pa.	22.60
Terre Haute, Ind.	22.50

PIG IRON

(Per gross ton, f.o.b. furnace)

	No. 2 Foundry	Malleable
Bethlehem, Pa.	$54.50	$55.00
Birmingham	48.88	....
Buffalo	52.50	53.00
Chicago	52.50	52.50
Cleveland	52.50	52.50
Everett, Mass.	55.25	55.75
Fontana, Calif.	58.50	....
Geneva, Utah	52.50	....
Granite City, Ill.	54.40	54.90
Lone Star, Tex.	48.50	48.50
Neville Island (Pittsburgh)	52.50	52.50
Steelton, Pa.	54.50	55.00
Swedeland, Pa.	56.50	57.00
Toledo, O.	52.50	52.50
Troy, N. Y.	54.50	55.00
Youngstown, O.	52.50	52.50

NONFERROUS INGOT

BRASS AND BRONZE: 85-5-5-5—27.25c; 88-10-2—44.50c; 80-10-10—32.25c; No. 1 yellow—23.25c.

ALUMINUM: 99 per cent plus, primary ingots 19.00c. Secondary No. 12 alloy 19.50c.

MAGNESIUM: 99.8 per cent standard ingots 24.50c, f.o.b. Freeport, Tex.

COPPER: Electrolytic 24.50c, Connecticut valley; Lake 24.61½c, delivered.

ZINC: High grade 18.85c, delivered.

IRON AND STEEL SCRAP

(Ceiling prices per gross ton as established by the Office of Price Stabilization)

	*No. 1 Heavy Melting Steel	**Steel, 2 ft & less	Punchings, Plate Scrap	Cast Iron Briquets
Birmingham	$39.00	$41.00	$41.50	$39.00
Buffalo	43.00	45.00	45.50	43.00
Chicago	42.50	44.50	45.00	42.50
Cincinnati	43.00	45.00	45.50	43.00
Cleveland	43.00	45.00	45.50	43.00
Detroit	41.15	43.15	43.65	41.15
Eastern Pa.	42.50	44.50	45.00	42.50
Los Angeles	35.00	37.00	37.50	35.00
Pittsburgh	44.00	46.00	46.50	44.00
San Francisco	35.00	37.00	37.50	35.00
St. Louis	41.00	43.00	43.50	41.00
Seattle	35.00	37.00	37.50	35.00

Above delivered prices are ceiling levels at basing points indicated. * Applies to dealer and industrial scrap; railroad heavy melting is $2 higher. ** Foundry steel 1 ft and under is $2 higher.

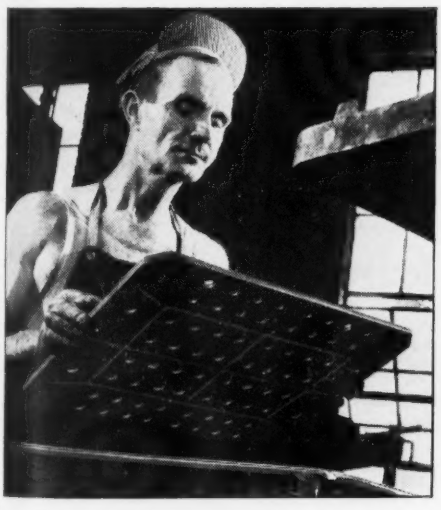
CAST IRON SCRAP

No. 1 cupola cast	$49.00
Heavy breakable cast	45.00
Burnt cast iron	41.00
Cast iron brake shoes	41.00
Stove plate	46.00
Clean auto cast	52.00
Unstripped motor blocks	43.00
Iron wheels, No. 1	47.00
Malleable	55.00
Drop broken machinery cast	52.00

Above ceiling prices, per gross ton, are f.o.b. shipping point. Add transportation charges to obtain delivered prices at any foundry.

"EDCO Dowmetal BOTTOM BOARDS eliminate swelled castings"

. . . says E. F. Dublinski
Foundry Superintendent
Mid-City Foundry Co., Milwaukee, Wis.



Above photo shows Mid-City Foundry Company molder placing EDCO DOWMETAL Bottom Board on flask preparatory to pressing. Mid-City Foundry produces high quality gray iron and alloy castings.

Take a tip from E. F. Dublinski. He speaks from experience in saying —"EDCO DOWMETAL Bottom Boards eliminate swelled castings". Since switching to magnesium boards, Mid-City Foundry does not have castings ruined through swelling caused by depressions burned into out-dated wood boards.

EDCO DOWMETAL Bottom Boards help produce castings that are true to pattern. The exclusive grooved and vented design permits escape of gasses, and insures mold stability. Causes for rejects are kept to a minimum.

"We consider EDCO DOWMETAL Bottom Boards as permanent equipment at Mid-City," adds E. F. Dublinski, "because they'll outlast wooden boards at least 30 to 1 and in no time at all pay for themselves."

Your molders will like handling these boards because they are light in weight, easy to stack, and there's no danger of splinters. EDCO DOWMETAL Bottom Boards will not warp or rot—there are no nails to come out, nothing to break or split—no upkeep.

Write us, or phone CApitol 7-2060 for price schedule and list of 74 standard sizes available from stock.

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1517 N. KILPATRICK AVENUE • CHICAGO 51, ILLINOIS
Aluminum Alloy Ingots • Zinc Base Casting Alloys

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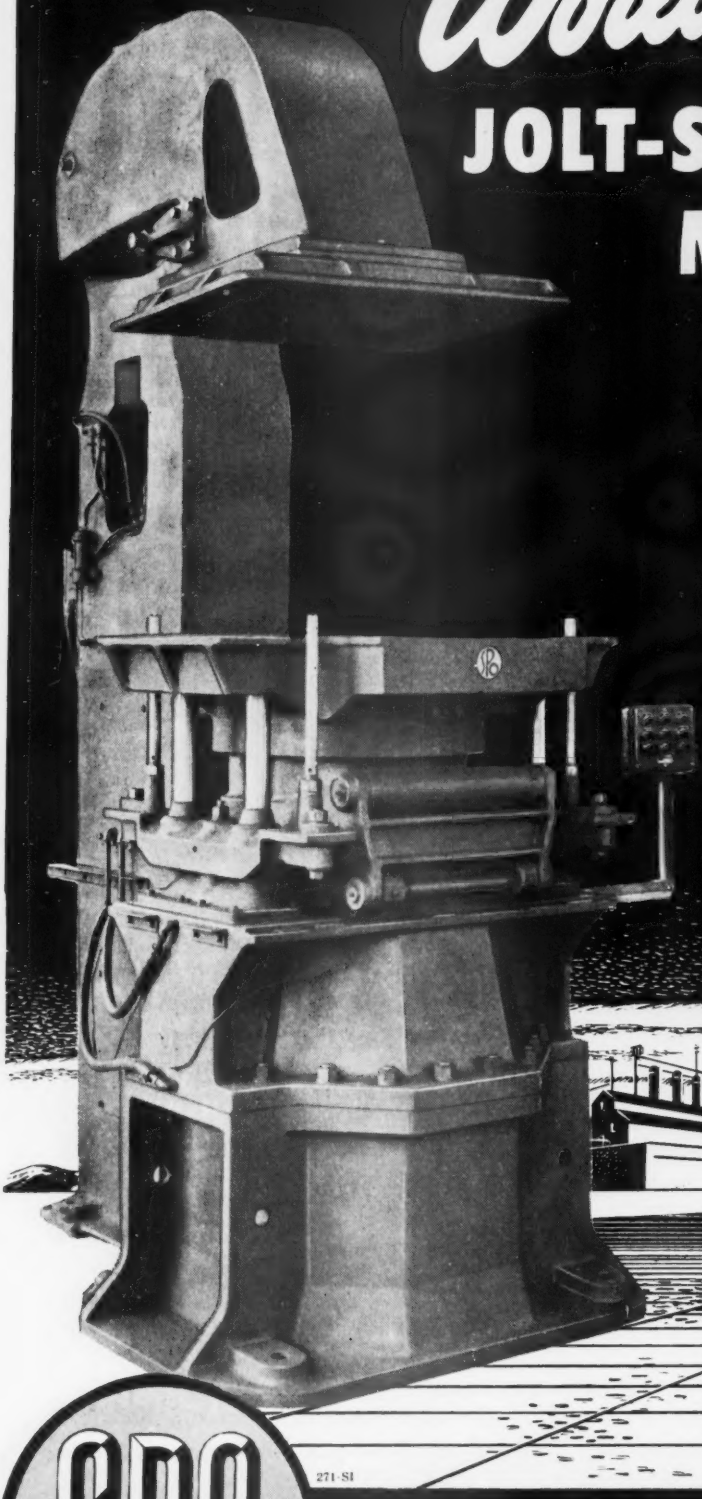
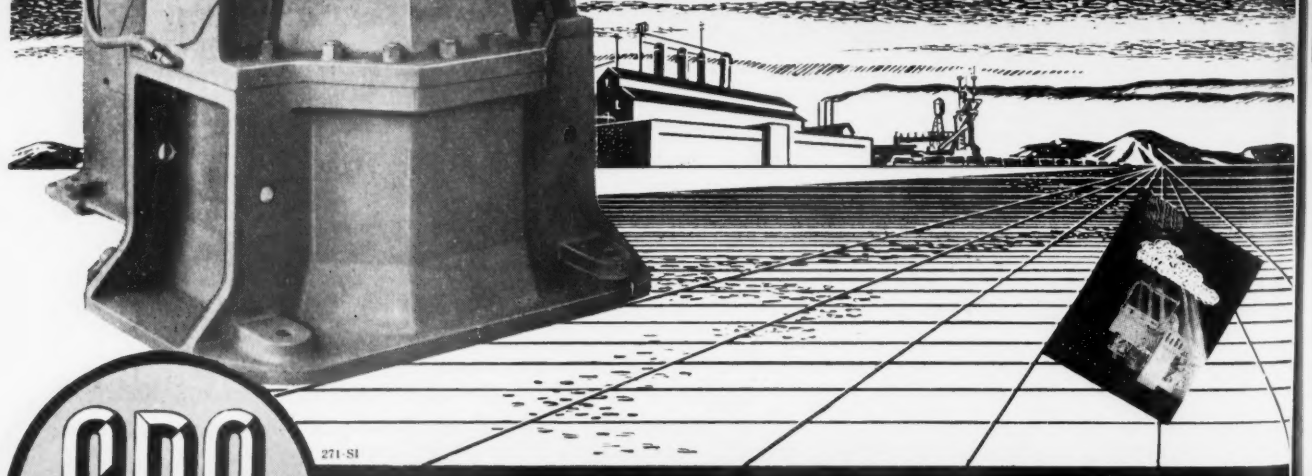


Massive copes and drags of uniform standard are produced by the new 15-ton **SPO** Model 2364 jolt-squeeze-strip machine. Featuring **push-button control,** it is semi-automatic.

Machine is designed for **efficiency of operation, high production capacity and operator safety.** Squeeze head is power operated . . . jolt cycle is timer-controlled . . . squeeze cycle regulated by pressure switch . . . and two-speed vibrating and stripping operations automatically controlled.

Model 2364 has a squeeze capacity of 80,000 pounds, jolt of 4000 pounds and pattern draw of 14 inches. Flask space ranges up to 54 inches, left to right, and to 50 inches, front to back. Machine stands 166 inches overall and is recessed into floor 50 inches.

Write today for Bulletin No. 2000 for complete data.



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SPO

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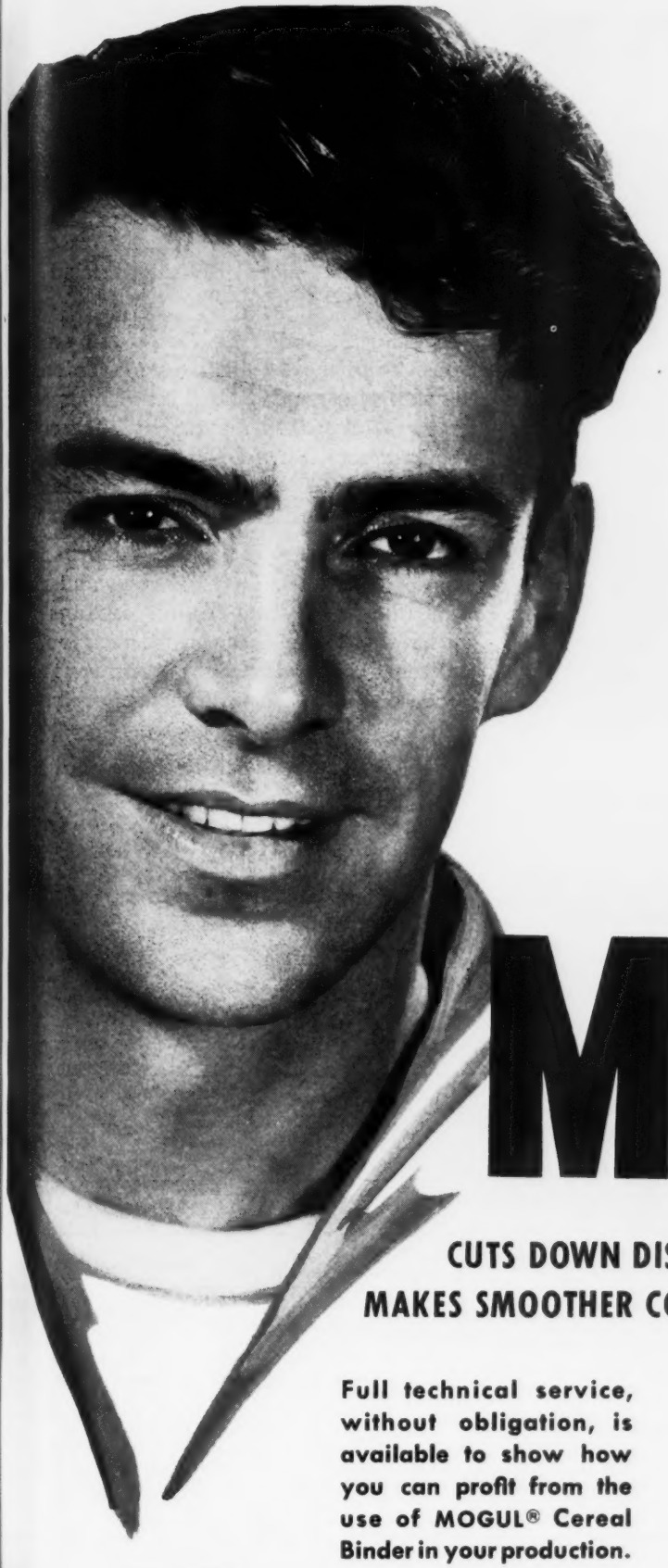

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17 Battery Place, New York 4, N. Y.

TABOR ...headquarter

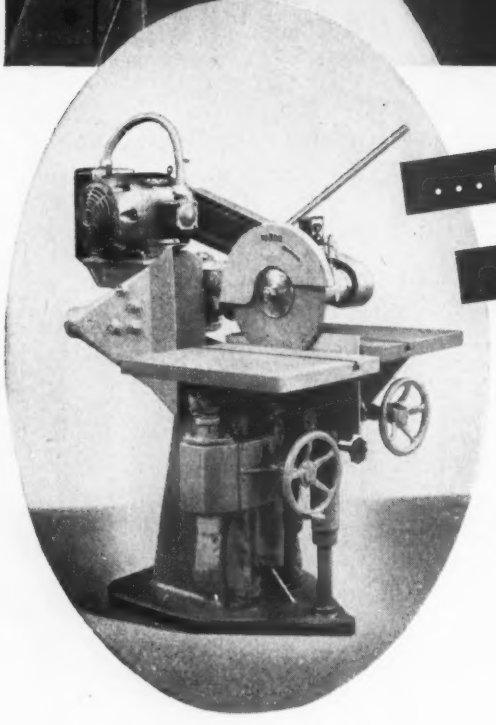
YOU'LL be placing emphasis on speed (and *more* speed) in the hurried and harried days ahead.

Speed and *Tabor-Brasive Cutoffs* are synonymous. Take the 10 H.P. machine pictured. It's cutting through 21 sq. in. of manganese bronze—and makes the cut in 70 seconds. That's mighty fast time—a good example of how top-speed production schedules are "meat" for Tabor Cutoffs.

As the table shows, these machines range from 5 to 15 H.P. They cut gates and risers from non-ferrous and ferrous castings in a matter of seconds. Clean, close cuts, too, that slash snagging and finish-grinding costs to the bone—often do away with them entirely.

And for *really tough* cutting jobs—in steel foundries, in copper cutting (gates and risers or crucible feed stock)—wherever the going's the toughest, Tabor makes a big-value 15 H.P. machine.

Equipped with today's hard-to-break, safe-to-use wheels, the Tabor-Brasive is *your* answer to more cuts at less cost, with safety. We welcome your inquiry!



. . . FOR GATES AND RISERS

SPECIFICATIONS — GATES AND RISERS CUTOFFS

Motor	Table Size (Split Type)	Wheel Diam.	Max. Height of Work Under Wheel
5 H.P. (Type D5AC)	28" x 20"	14" Max. Thickness—5/32"	4" (head does not swing to side)
5 H.P. (Type B5AC)	28" x 20"	16" Max. Thickness—3/16"	10" (with head over table)
7½ H.P. (Type B7½AC)	28" x 20"	16" Max. Thickness—3/16"	10" (with head over table)
7½ H.P. (Type C7½AC)	36" x 25"	16" Max. Thickness—3/16"	17" (with head over table) 40" (with head swung to side)
7½ H.P. (Type C7½AF)	36" x 25"	16" Max. Thickness—3/16"	20" (with head over table) 46" (with head swung to side)
10 H.P. (Type C10AF)	36" x 25"	16" Max. Thickness—3/16"	20" (with head over table) 46" (with head swung to side)
15 H.P. (Two-speed)	41" x 30"	20" Max. Thickness—3/16"	18" (with head over table) 44" (with head swung to side)

All motors fully enclosed, fan-cooled, ball bearing

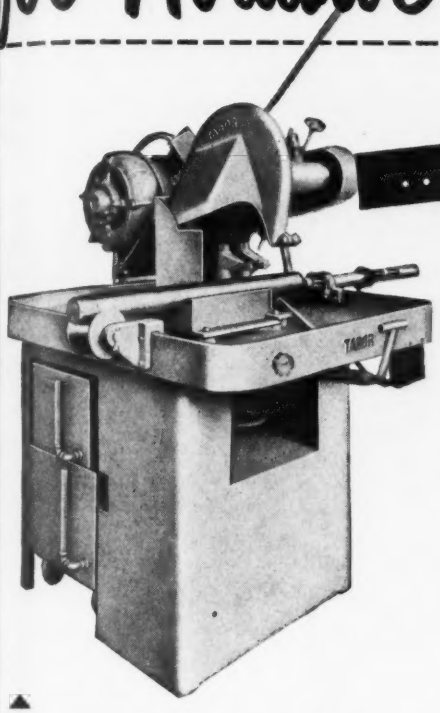
REPRESENTATIVES

Snyder Foundry Supply Company, Los Angeles, Calif.; The Pacific Graphite Company, Inc., 40th & Linden Sts., Oakland 8, Calif.; Carl F. Miller & Company, Seattle, Washington; Harry H. Reich, Trussville, Ala.

they're cut out . .

...for Abrasive Cutoff Machines!

...FOR BAR STOCK AND SHAPES



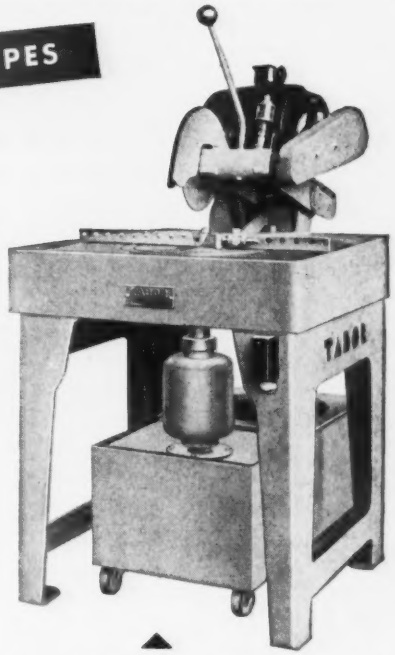
Type D10FWP. 10 H.P., wet cut, right angle; wheels up to 16" dia. (up to 3/16" thick); 10,000 FPM wheel speed; wheel and coolant push-button controlled; cuts 2½" solids, 3" x ⅜" angles, 4½" tubing, ¾" x 3" flats.

THIS page is of special importance to management of captive shops and foundries with their own machine shop operation.

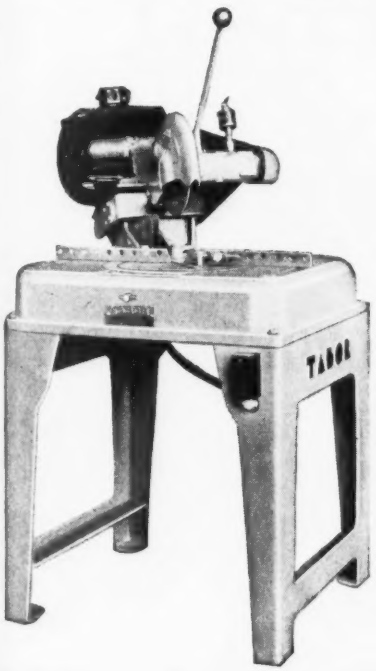
Pictured and described are the newest additions to the Tabor line—abrasive cutoff machines for bar stock and shapes. There's a size and type to meet every need.

The "heart" of these machines—the spindle—bears the same stamp of excellence for which our foundry units are famous. Timken Bearing-mounted, specially constructed, the spindle assures cool running and reduces end-play adjustment to an all-time low.

Get full details on these tough, precise, "production-minded" units. We have new bulletins. They're yours for the asking.

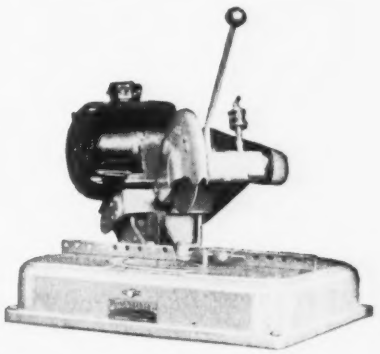


Type G3AEW. 3 H.P., wet cut, right angle to 45° bevel; 12" wheel (thickness to 3/32"); 10,000 FPM wheel speed; 3,200 rpm spindle speed; cuts ¾" solids or equiv., 2" tubing, 2" x 6" light sheet formed sections, ½" x 1" flats.



Type G3AE. 3 H.P., dry cut, right angle to 45° bevel; 12" wheel; 15,000 FPM wheel speed; 4,800 rpm spindle speed; under-machine spark and refuse pan is provided. Cutting capacities same as for Type G3AEW.

Type G3AE (Bench Mount Model). 3 H.P., dry cut, right angle to 45° bevel; cutting capacities same as for Type G3AEW.



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flask and pattern plate
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please remember . . . .

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The counterboring tool and wrench are the only tools needed for an installation of Hines Pins and Bushings

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The refractory industry has kept pace with steel by producing refractories that last longer . . . stand higher heats . . . are available in adequate quantities. General Refractories is proud of its part in this task of serving steel.

Inside this furnace you may find

The Inside Story

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GENERAL REFRACTORIES COMPANY
PHILADELPHIA

RITEX C and RITEX A Basic brick, STEELKLAD brick, General's Silica and Fireclay brick. But throughout the plant you'll find many another General product scientifically designed and produced to do the particular job at hand.

General offers the steel industry exhaustive research facilities, modern production methods, skilled personnel. General's 43 mines, 29 plants, 18 sales offices and more than 200 distributing agencies are strategically located throughout the nation and abroad. In short, General offers you a complete refractories service!

A Complete Refractories Service

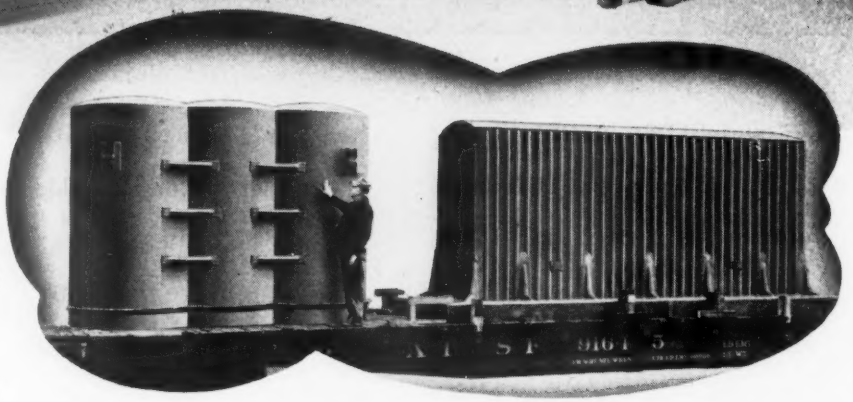
The PRESSED STEEL CO.

PSC

ANNEALING CONTAINERS & COVERS

In Any

DESIGN
ALLOY
SIZE
QUANTITY



Do you need a special type of annealing equipment?...We have designed containers and covers for every imaginable product.

Have you a temperature problem?...We fabricate from the entire list of heat-resisting alloys.

Are size of the equipment or quantity required a cause for consideration?...As indicated by the illustrations, we furnish boxes, baskets, etc., for the smallest parts, or covers for the biggest steel mill anneals -- singly or by carload.

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Here are 4 ways that "Pressed Steel" light-weight annealing units cut costs and speed production, as shown by plant records:

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3) REPLACEMENT SAVING--Some installations have been in constant service for 20 years.

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We furnish a complete line of annealing and carburizing boxes, covers, baskets, racks, tubes, retorts, etc. As pioneers of sheet-alloy heat-treating equipment, we offer a wealth of experienced engineering assistance. Send blue prints or write as to your needs.

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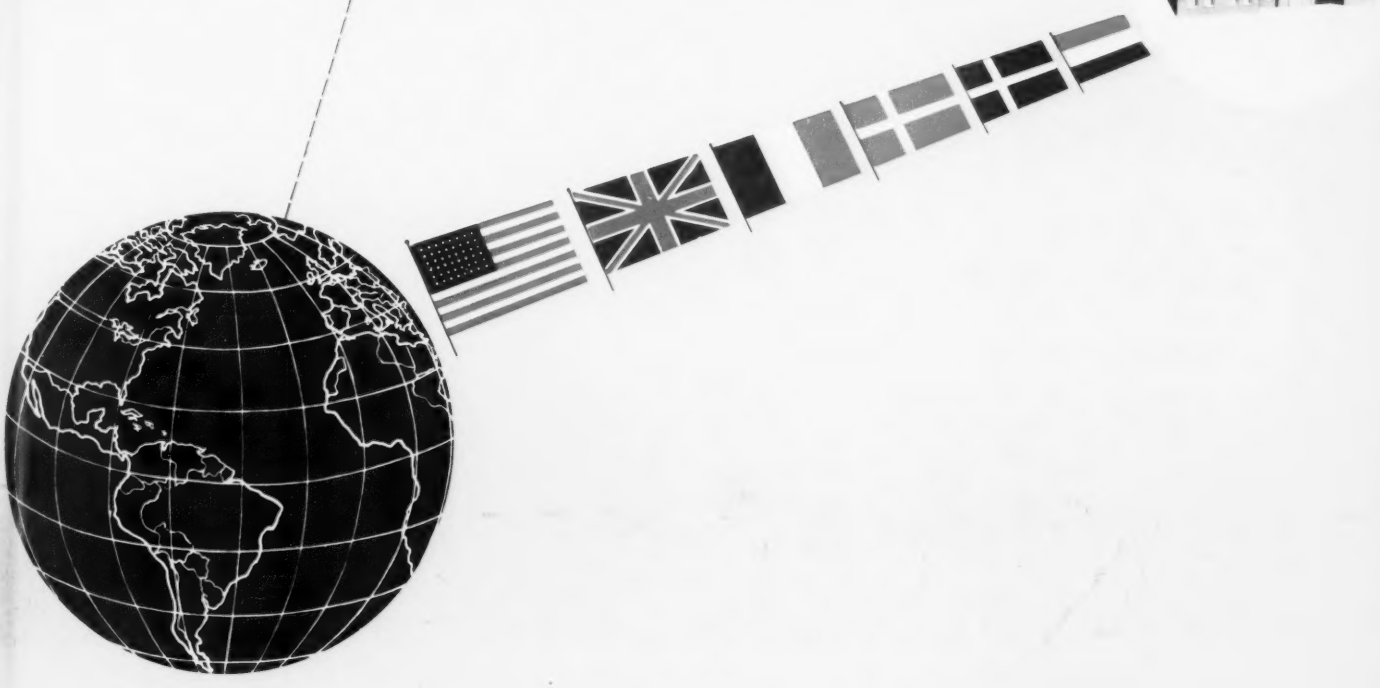
Lindberg paroli universala lingvajo kie ajn metalo estas fabrikid

Yes — "Lindberg speaks the universal language wherever metal is fabricated" — that's the translation of the headline in Esperanto — the universal language!

And in the many parts of the world where Lindberg Furnaces are manufactured and used, you'll find these furnaces speaking another universal language — the one that needs no translation — the language of production men.

The following pages show some foreign installations of hard-working Lindberg furnaces — some shipped from the United States, but most of them built from Lindberg drawings by our world-wide network of manufacturing affiliates.



Lindberg . . . . in any language means finer furnaces

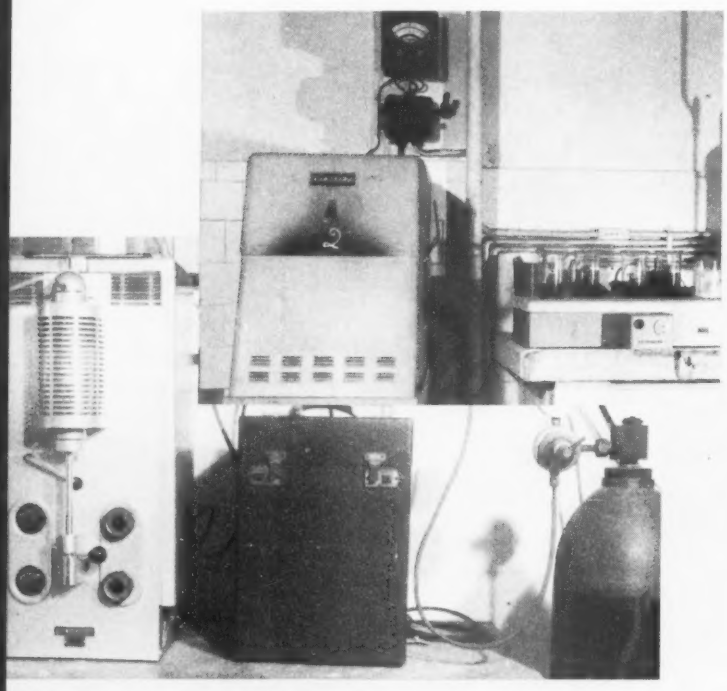
J^{s} Zimmer & Zonen, Amsterdam

Wij stellen het zeer op prijs U hiermede te berichten, dat de Lindberg oven, welke reeds enige jaren met veel succes dag en nacht in ons bedrijf in gebruik is, thans met evenveel succes werkt in onze nieuwe afdeling: Staalharderij.

In onze zeer modern ingerichte loonstaalharderij, waarin voor een paar duizend binnenlandse bedrijven de onderdelen worden gehard, heeft de Lindberg oven veel bijgedragen om onze productie te verhogen.

We beg to inform you herewith that the Lindberg furnace, which has already been successfully day and night in use in our plant, is working at the moment with as much success in our new department: Steelhardening.

In our very modern equipped commercial hardening shop, in which the parts for a couple of thousand inland firms are hardened, the Lindberg furnace has done much to increase our production.



Ministério Da Agricultura Departamento Nacional Da Produçao Mineral Laboratório Da Produçao Mineral, Rio De Janerio, D. F.

Atendendo ao pedido dos representantes no Brasil da Lindberg Engeneering Co., de Chicago, Estados Unidos da America do Norte, declaramos ter em funcionamento, em nossos laboratorios, diversas placas aquecedoras e fornos eletricos, fabricados pela Lindberg.

Todo esse material vem funcionando a inteiro contento de nossos tecnicos.

At the request of the representatives in Brazil of the Lindberg Engineering Co., Chicago, U.S.A., we declare that we have in use, at our laboratories several hot plates and electric furnaces manufactured by Lindberg.

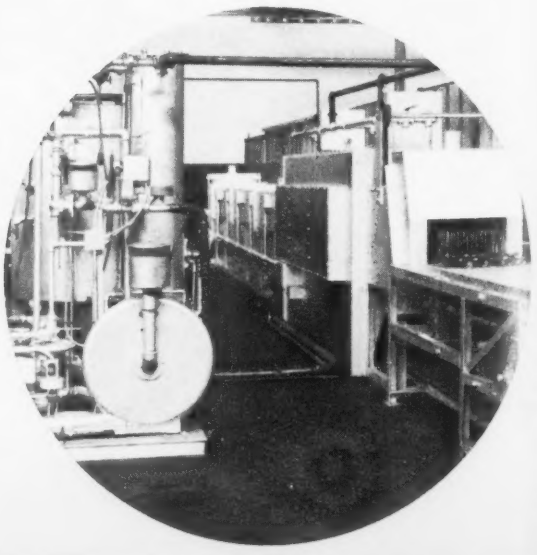
All the above material is entirely satisfactory to our technicians.

Fiat, Sezione Automobili, Torino

I nostri forni Lindberg funzionano ottimamente. Ci é gradita l'occasione per porgerVi i ns/ più distinti saluti.

Our Lindberg Furnaces function perfectly.

On this pleasant occasion we present our distant salutation.



Lindberg in foreign lands

Electric Resistance Furnace Co.
Weybridge, Surrey, England

Electric Furnace Co.
Waybridge, Surrey, England

Etablissements Jean Aube
Paris, France

Gerard Plueger
Antwerp, Belgium, Laboratory Furnaces

Allmet Industries Pty., Ltd.
Sydney, Australia

A. Schuabarth & Co.
Basle, Switzerland

Sabin St. Germain
Mexico, South America

Williams & Wilson
Quebec, Toronto, Montreal,
Windsor, Canada

Lindberg Itialana
Milan, Italy

Impresa Progresso
Rio de Janeiro, Brazil, Laboratory Furnaces

Lutz Ferrando y Cia
Buenos Aires, Argentina

Ing. G. W. Berg & Co.
Helsingfors, Finland

Axel Kistner
Stockholm, Sweden

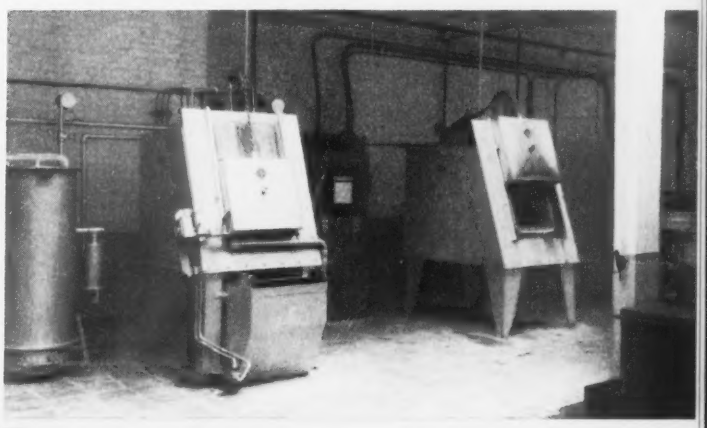
Innocenti, Milano

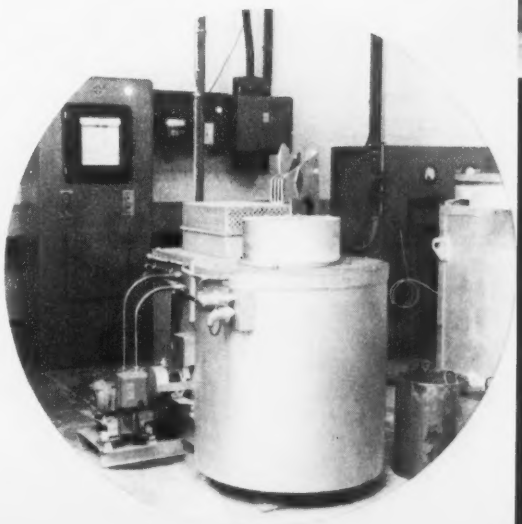
Abbiamo installato i Vs. forni che funzionano da tempo con ns. completa soddisfazione. Siamo lieti di farVi questa dichiarazione e di segnalarVi che, grazie ali Vs. impianti, abbiamo ottenuto notevoli vantaggi sia nella qualità del prodotto, sia nel costo di produzione.

Vogliate gradire, coi ns. ringraziamenti, i ns. migliori saluti.

We have installed your equipment which functions with complete satisfaction. We are happy to declare and signify our thanks to you and all the employees. We have kept complete books, which prove the advantages and profit and also the quality of the product and the low cost of production.

We thank you very much and send greetings.

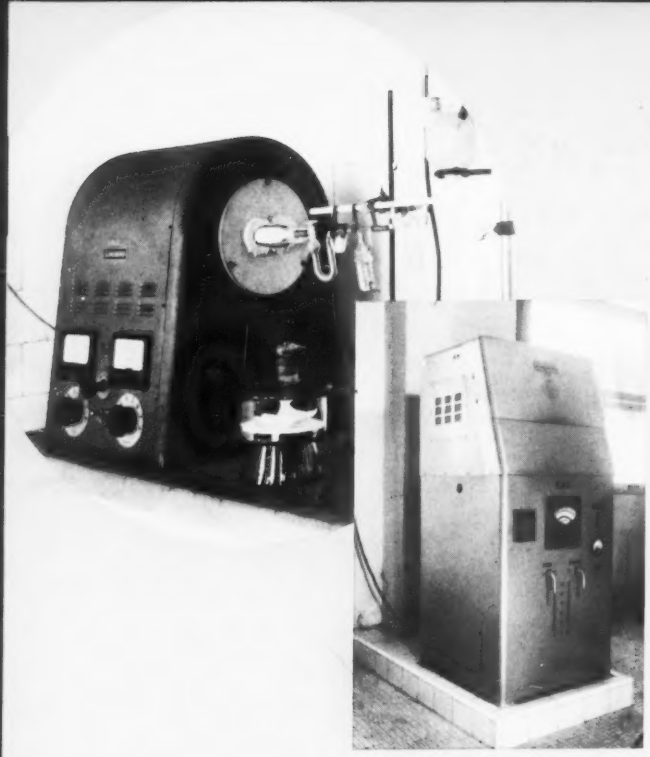




La Compagnie Singer, Paris

Les fours Lindberg construits sous licence par les Etablissements Jean Aube & installes dans nos atelires nous donnent entiere satisfaction.

The Lindberg Furnaces built under licence by Jean Aube and installed in our shop give us complete satisfaction.



Ministerio Do Trabalho, Industria E Comercio Instituto Nacional De Tecnologia, Rio de Janeiro, D.F.

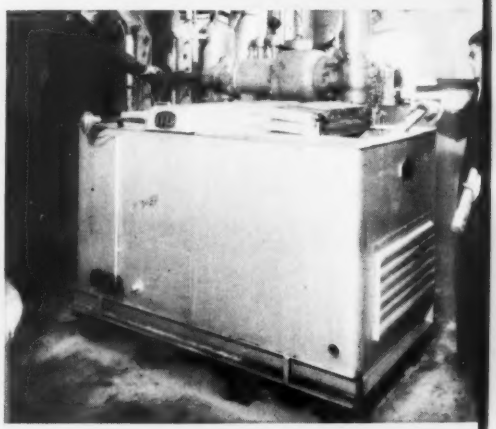
Dentre a aparelhagem de aquecimento existente na Divisão de Indústrias Metalúrgicas, ocupam lugar proeminente, as placas aquecedoras H-2 e os fornos CR-5, CF-1, B-2 e G-10, tôdos de fabricação de Lindberg Engineering Co.

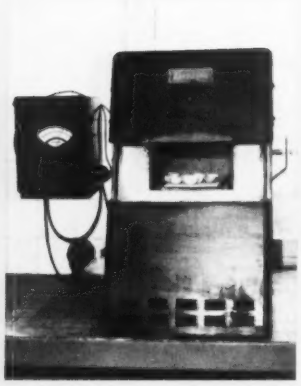
O uso constante que vem fazendo esta Divisão, há mais de cinco anos, de tais equipamentos com absoluto sucesso quanto à perfeição de funcionamento, atesta eloquentemente a alta qualidade de sua fabricação, que não despreza aliás as linhas estéticas, bem características das placas aquecedoras e dos fornos Lindberg.

Amongst the heating apparatus existent at the Metallurgical Industries Division, the hot plates H-2 and the furnaces CR-5, CF-1, B-2 and G-10, all manufactured by the Lindberg Engineering Co., occupy a prominent place.

The constant use that this Division is making of such equipment, for over five years, with absolute success as to the perfect functioning, attest eloquently the high quality of its manufacture, and maintain the esthetic lines, which is quite characteristic of the Lindberg hot plates and furnaces.

Lindberg Melting Furnaces, including the two-chamber aluminum induction furnace illustrated here, are built in England by the Electric Furnace Co. Lindberg Heat Treating Furnaces are built by the Electric Resistance Furnace Co. both of Weybridge, Surrey.





Société Anonyme John Cockerill Seraing (Belique)

Veuillez noter que les fours Lindberg qui sont en service en nos usines d'Athus, nous donnent satisfaction.

Agréez, Messieurs, nos salutations distinguees.

You'll kindly note the Lindberg furnaces that are in service in our shops at Athus (Belgium) are giving us satisfaction.

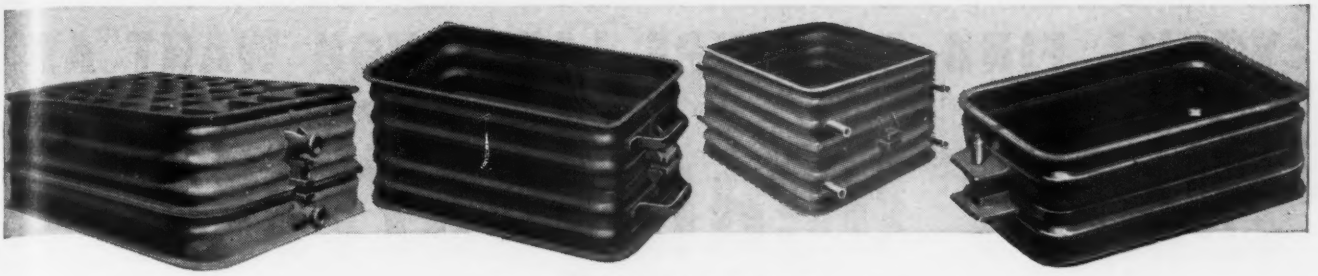
Lindberg manufactures a complete line of industrial furnaces

Cyclone Tempering Furnaces
Super Cyclone High Temperature Convenction Furnaces
Atmosphere Heat Treating Furnaces
Atmosphere Brazing and Sintering Furnaces
Atmosphere Generators

Melting Furnaces, Gas, Oil, and Electric
Two-Chamber Induction Melting Furnaces
High Frequency Induction Heating Units
High Frequency Carbon Determinator Units
Laboratory Furnaces and Equipment

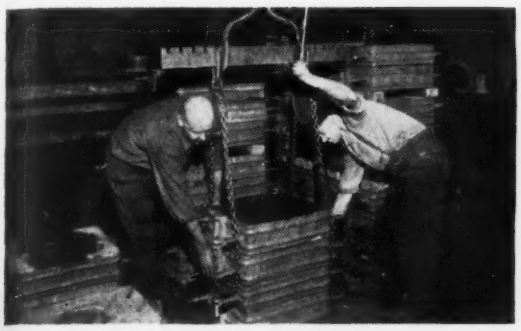
LINDBERG FURNACES

Lindberg Engineering Company, 2450 W. Hubbard Street, Chicago 12, Illinois



WIDE RANGE OF HANDLES AND PIN LUGS

Assure Efficient Truscon Steel Flask Performance



The needs of your particular operations can be met efficiently by Truscon welded end handles, welded corner handles and welded handle sockets for two-man handling. Straight trunnions and heavy split trunnions are available for mechanical handling. Truscon Pin Lugs are available as follows: Single or double-bearing welded combination handle and pin lug for use on one-man flasks. Single or double-welded type pin lugs, and double face welded type dowel pin lugs, for use on one or two man flasks.

No need for battleship *thickness* in flask walls. Correctly engineered thickness, highly durable materials, and scientific design, as exemplified in Truscon Steel Flasks, give battleship *service* without unnecessary weight or shop handling costs. ● Truscon Steel Flasks have a long record of success in foundry operations, particularly under extreme conditions of heavy service. An experienced Truscon man will be glad to explain the many advantages which Truscon Steel Flasks offer you.

Write for illustrated and descriptive catalog.

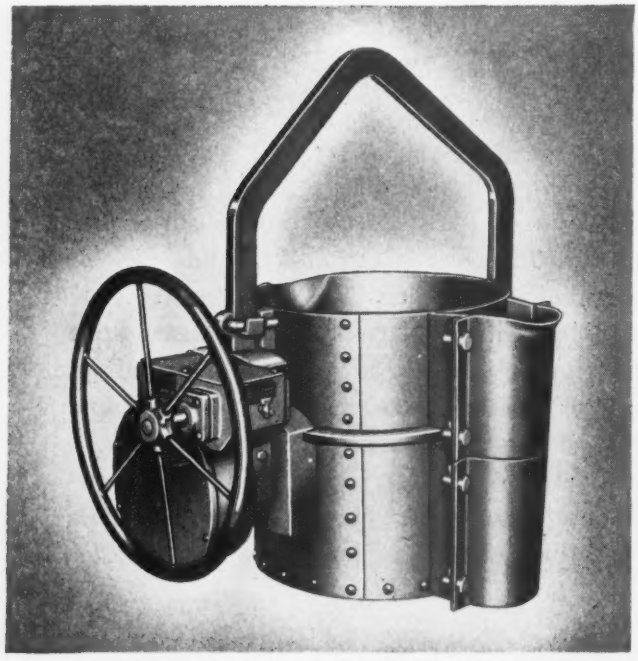
TRUSCON STEEL COMPANY

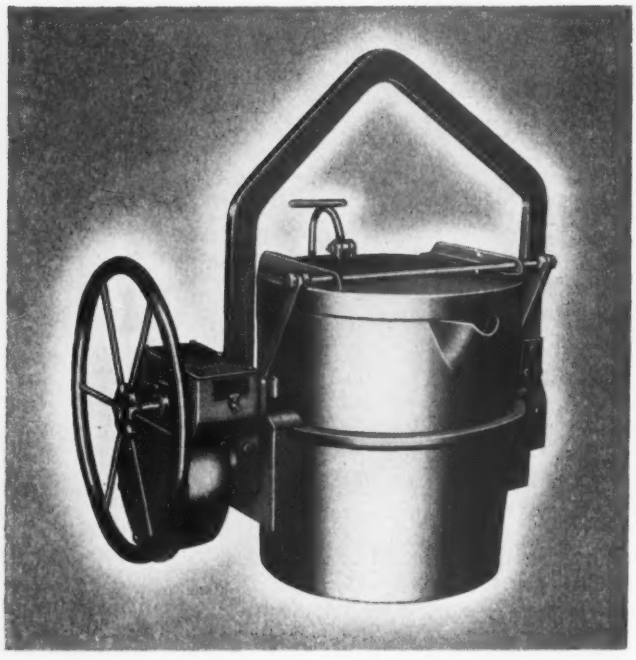
PRESSED STEEL DIVISION • 6100 TRUSCON AVENUE • CLEVELAND 4, OHIO

SUBSIDIARY OF REPUBLIC STEEL CORPORATION

YOU'LL FIND THE TYPE LADLE YOU WANT AT

Ladle Headquarters





Industrial Equipment has all the ladles: teapot spout . . . covered . . . cylindrical . . . reservoir . . . buggy . . . bottom discharge . . . and many others, standard and special.

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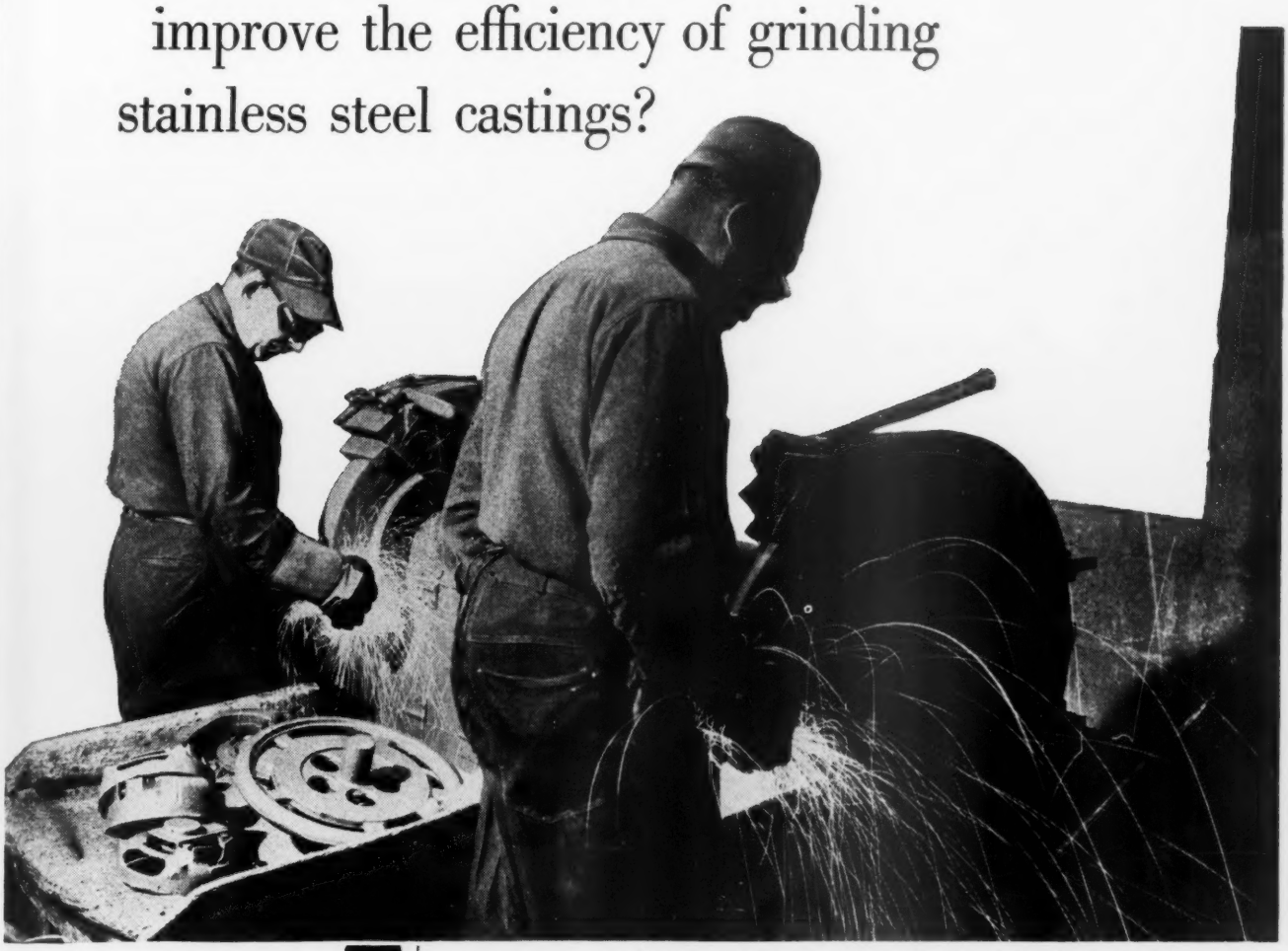
What's U. S. Rubber doing to improve the efficiency of grinding stainless steel castings?



GRINDING STAINLESS STEEL CASTINGS. This large foundry specifies "U. S." wheels; prefers them because they grind with high efficiency and treat the castings right.

GRINDING THE "GATES" off a stainless steel valve housing casting, with a U. S. *Royalite* Wheel.

CLOSE-UP of high-speed portable grinder smoothing castings.

Backed by over 88 years of experience in the abrasive industry, U. S. Rubber technicians have developed wheels that efficiently handle even the specialized problems presented when grinding stainless steel. This extensive "know-how" also puts U. S. Rubber in a position to provide you with wheels for grinding malleable iron, gray iron, steel, and Mechanite castings. There is a U. S. *Royalite* wheel for your job. Put your grinding wheel problem in the hands of U. S. Rubber technicians. Write to address below.

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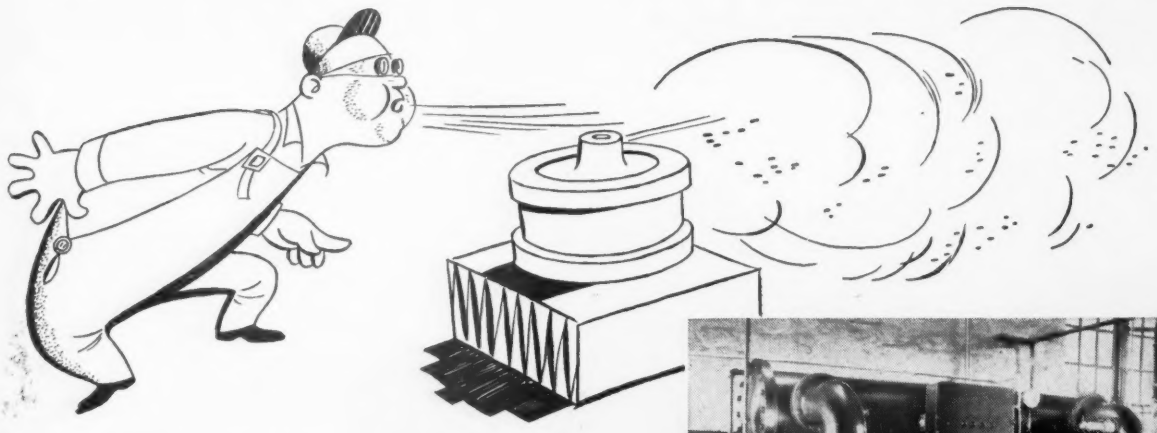
UNITED STATES RUBBER COMPANY

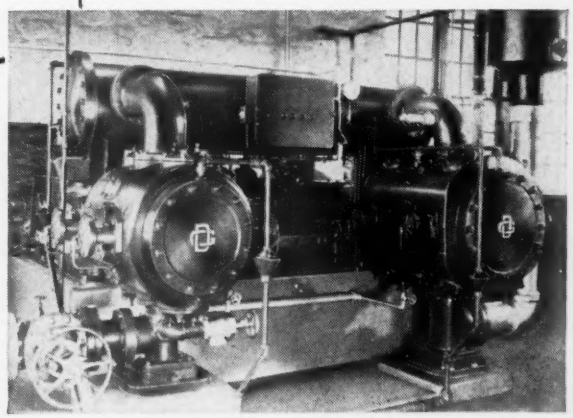
MECHANICAL GOODS DIVISION, ROCKEFELLER CENTER, NEW YORK 20, N. Y.

You don't have to skimp on compressed air!

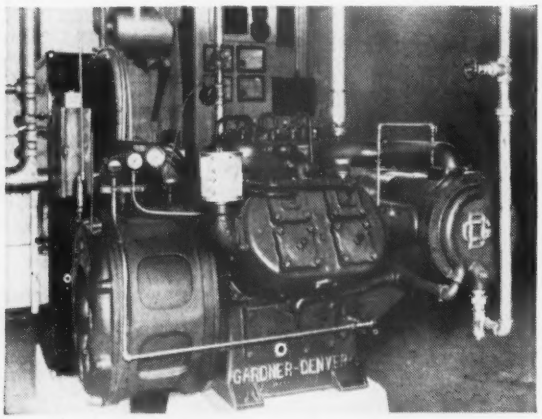


An ample supply of compressed air arms you with many opportunities to speed foundry production—conserve man-hours—hold costs in line. Especially when it's the lower-cost-per-cubic-foot air from a Gardner-Denver Compressor.

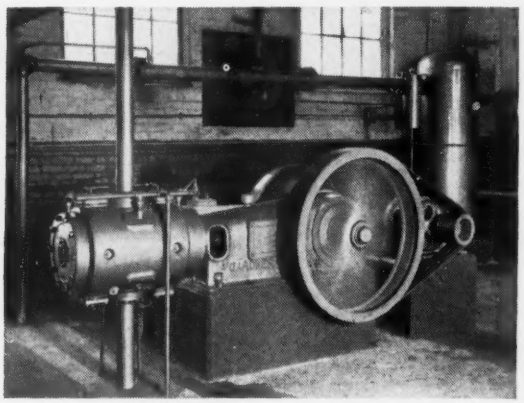
Backed by more than 90 years of quality manufacturing, Gardner-Denver Compressors handle constant peak loads—dependably . . . keep maintenance and operating costs so low you can use compressed air throughout your foundry—without skimping. Write us today for complete information.



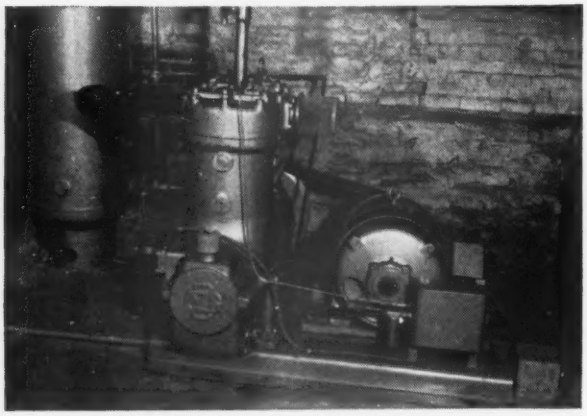
HA Two-Stage, Horizontal Compressor 593 to 1854 cu. ft. displacement per min.



WB Two-Stage, Vertical Compressor 142 to 686 cu. ft. displacement per min.



RX Single-Stage, Horizontal Compressor 89 to 1292 cu. ft. displacement per min.



AA Single-Stage, Vertical Compressor 32 to 183.6 cu. ft. displacement per min.

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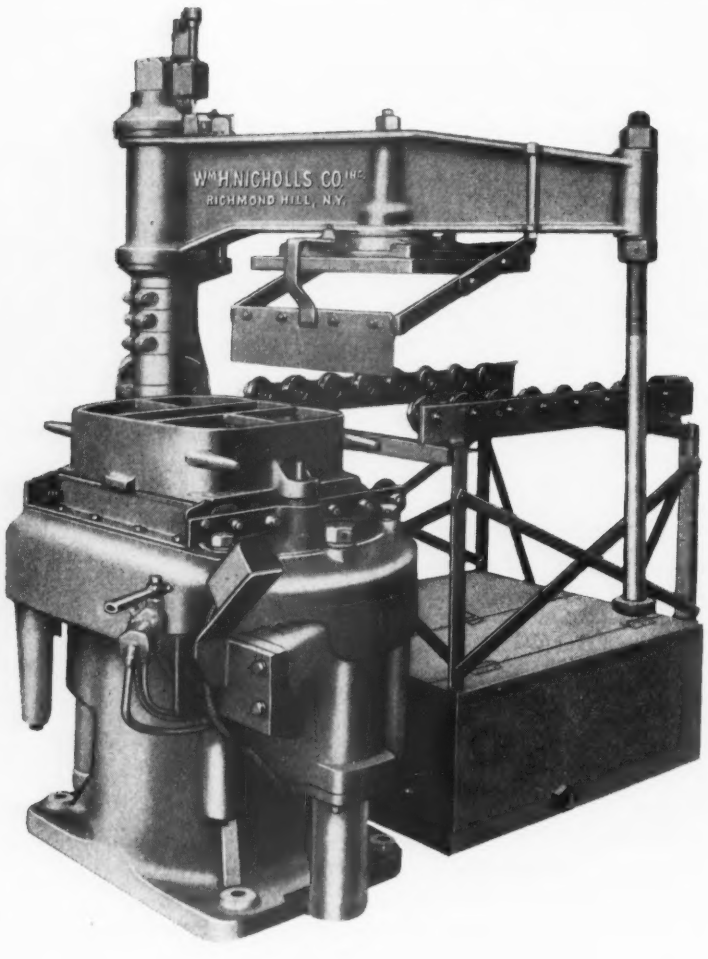
HEAVY-DUTY MOLDING MACHINES

COMBINATION JOLT & POWER SQUEEZERS WITH PNEUMATIC PATTERN DRAW AND POWER OPERATED, PARALLEL, SELF POSITIONING SQUEEZE HEAD, AND EQUIPPED WITH ELECTRICAL CONTROLS FOR SINGLE BUTTON AUTOMATIC OPERATION



14-36 TYPE "D"

Heavy Duty Combination Jolt & Power Squeezer Molding Machine with pneumatic pattern draw and power operated self positioning parallel squeeze head. Equipped with electrical controls for single button automatic operation of Jolt, Squeeze, Pattern Draw and Cross-arm. Including Automatic Sand Strike-off, Mold Pusher & Adjustable Flask Rolloff Device.

Also larger size machines now equipped with electrical controls for automatic operation. Nicholls builds a complete line of Molding Machines comprising stationary and portable types for the production of light, medium and heavy castings. Descriptive literature available for each type.

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SHOCK RESISTANT CASTINGS
that need NO Heat Treatment . . .

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Many industrial and commercial concerns are finding FRONTIER 40-E Aluminum Alloy the solution to their problems. Combining high strength with light weight, FRONTIER 40-E is non-heat-treated to provide greater adaptability to product applications. It has unusual machineability, shock and corrosion resistance, together with pressure tightness and high yield strength. This versatile aluminum alloy has been used in successful product applications calling for the precision operation of aircraft defroster parts as well as those calling for the light weight and heavy strength of truck axles.

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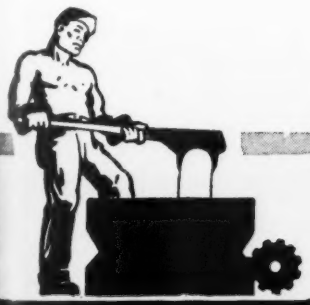
Write today for FREE ALLOY DATA book giving you engineering and metallurgical facts that can help you solve your alloy problems.

Remember — if aluminum can do it better — FRONTIER 40-E Aluminum Alloy can do it best!



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PREVENTS STICKING ...MAKES SAND FLOW FREELY

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HAS BEEN

PROVED AND ACCEPTED

BY LEADING FOUNDRIES

By adding only 8 ounces or less of DELTA 96·B SAND RELEASE AGENT, per ton, to your core or molding sand mixes, your sands will flow freely . . . be easier to handle . . . easier to use. They will not stick to core boxes or patterns no matter how intricate they may be.

DELTA 96·B SAND RELEASE AGENT is the result of persistent research by DELTA Laboratories devoted to the discovery and development of a lubricant-dispersant for use in sand mixes. DELTA 96·B is a liquid which provides properties hitherto unknown in sand conditioning materials. It is completely volatile at elevated temperatures and does not contaminate the sand.

Prove it yourself in your own foundry. Ask for a test sample. No cost or obligation. You will also receive instructions for use. Write today.

READ WHAT USERS SAY ABOUT DELTA 96·B SAND RELEASE AGENT

". . . . with the addition of 96·B we get improved core density and more uniformly-rammed mold hardness."

". . . . with the addition of 8 ozs. of Delta 96·B we are now able to blow cores we otherwise couldn't blow."

". . . . Delta 96·B gives the sand improved flowability. Our sand now works much more freely and leaves the core boxes clean."

". . . . and the trouble we had with sand sticking in the hoppers, in the chutes and on the conveyor has been eliminated with the use of Delta 96·B."

DELTA OIL PRODUCTS CO.

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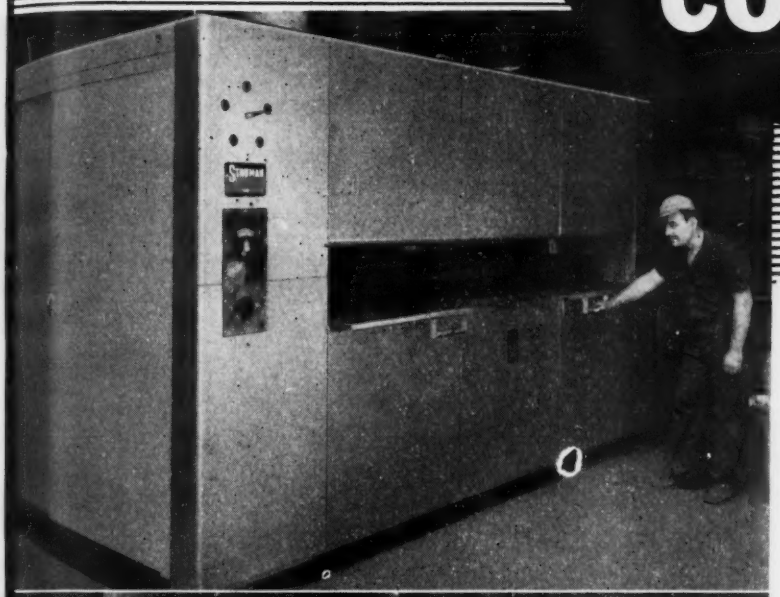
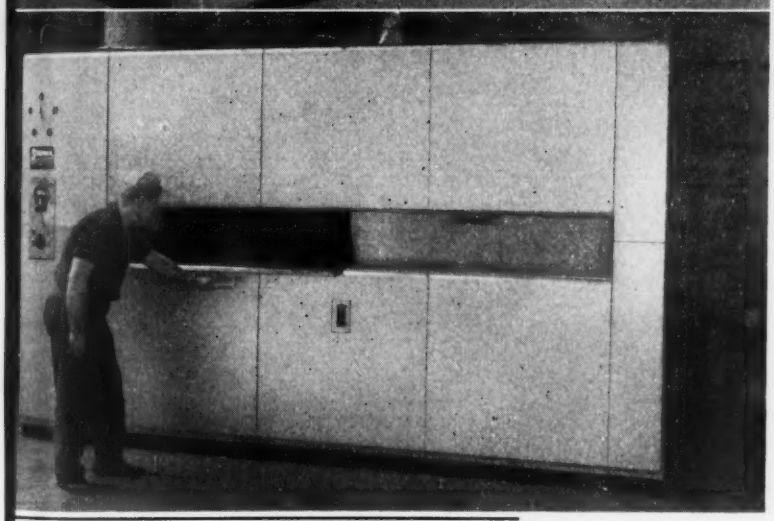
NEW! STROMAN • Revolving Tray CORE OVENS





Yes Sir, here they are . . . Stroman Revolving Tray Core Ovens for the baking of the smaller type of cores in both production and jobbing foundries. These ovens are Indirect Fired and incorporate the famous Stroman Recirculating Heat principle that assures the cleanest type bake as well as the most economical. No products of combustion can enter the baking chamber so cores are free from soot and other discolorating combustion gasses. The Stroman Revolving Tray Core Oven permits the cores to pass through all zones of heat in the oven, and provides the most uniform baking. Stroman Core Ovens are completely automatic in operation, all controls for complete oven operation are at the operator's finger-tips. All operating Mechanism and combustion equipment is concealed behind sliding doors and is kept free from dust, etc. Trays are *completely stabilized,* and will not swing, jitter, or sway. A tray indicator tells the operator where every tray is at all times. Heavy insulation makes it a very cool oven to work around. Split doors make it unnecessary to open the complete oven at one time. When these doors are lowered they form a convenient rest for the core boards while charging. There is a high temperature light in the oven that gives perfect light for bake inspection.

All in all they are the most efficient core ovens for your foundry. They provide perfect heat for speedy but perfect core baking. Fired by gas, oil or combination—gas or oil burners, they will do your core baking better and at decided savings. Here are the sizes . . . one will fit your needs:

No. of Trays	Tray Sizes
4	26" x 76"
5	26" x 76"
5	26" x 96"
5	26" x 112"
7	26" x 96"
8	26" x 96"
8	26" x 112"

MANY SIZES READY FOR SEPTEMBER DELIVERY!

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DIVISION OF

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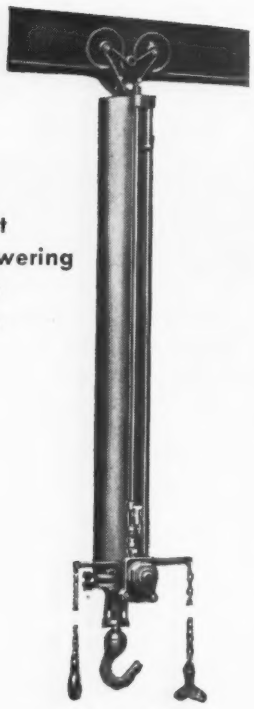

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Air Hoists
for Low Cost
Lifting or Lowering
of Materials
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AIR COMPRESSORS
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CYLINDERS & HOISTS

Tank Mounted
Up to 15 H.P.
Inclusive—
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Water-Cooled Compressor,
Up to 50 H.P. Fully Enclosed

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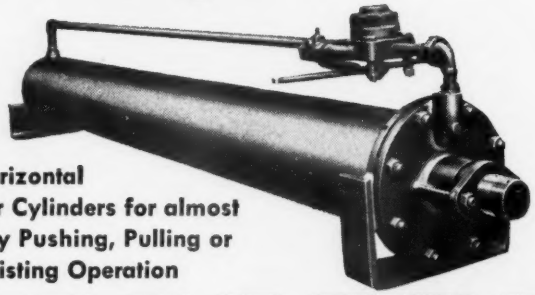

Horizontal
Air Cylinders for almost
any Pushing, Pulling or
Hoisting Operation

I-51-1R

Curtis equipment has stood the test of time, because it is precision made from top quality raw materials with 97 years of "know how."

CURTIS PNEUMATIC MACHINERY DIVISION
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☐ **AIR CYLINDERS**
Stroke? ☐ Capacity? ☐

☐ **AIR COMPRESSORS**
Capacity? ☐ Pressure? ☐
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Name.....
Firm.....
Street.....
City.....Zone.....State.....

More mixing...less fixing...with Mix-Muller on TIMKEN® bearings

THIS Simpson No. 3F Mix-Muller mixes all types of foundry sands, as well as hundreds of ceramic and refractory materials. It has a distinctive mulling action that always produces a uniform product in a minimum of mixing time. Power requirements and operating costs are kept low, too. And to carry the heaviest loads at high and low speeds, with minimum time-out for maintenance and repairs, Timken® tapered roller bearings are used in the speed reducer, vertical post, rocker arms and muller wheels.

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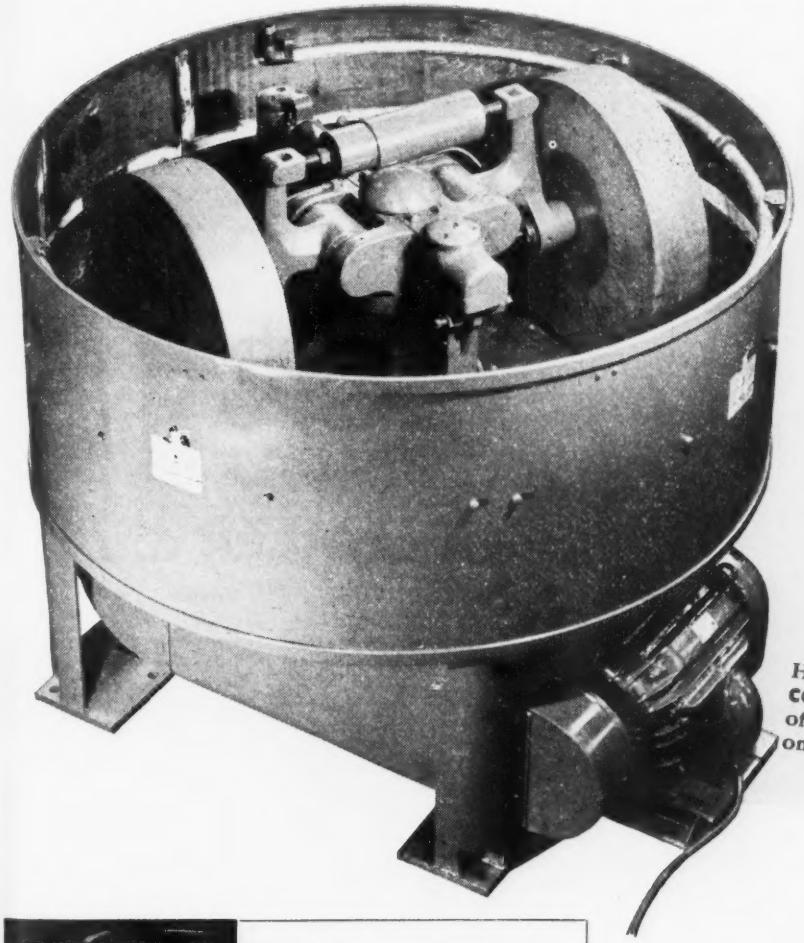
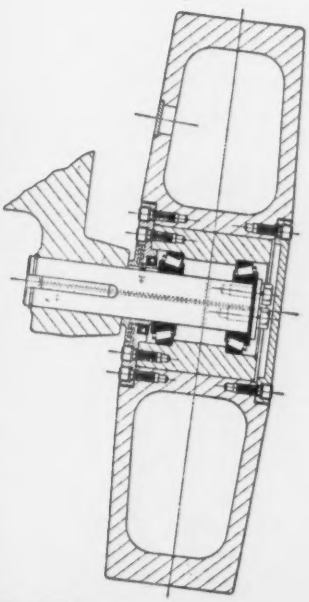
Because of incredibly smooth surface finish and true rolling motion, Timken bearings practically eliminate friction. And more effective closures are possible because Timken bearings keep housing and shaft concentric. Dirt and grit are kept out; lubricant kept in.

Backed by more than half a century of bearing research and development, Timken bearings are first choice throughout industry. Insist upon them for all the equipment you build or buy. Always look for the trade-mark "Timken" on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.





How **THE NATIONAL ENGINEERING COMPANY** mounts the muller wheels of its No. 3F Simpson Mix-Muller on Timken tapered roller bearings.

WE MAKE OUR OWN STEEL

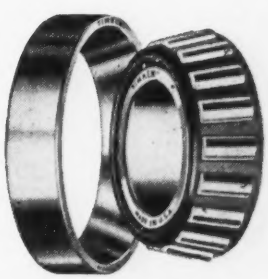
The special grade alloy steel which gives Timken bearings their strength and resistance to wear, is made in our own steel mills.

The Timken Roller Bearing Company is the acknowledged leader in: 1. advanced design; 2. precision manufacturing; 3. rigid quality control; 4. special analysis steels.

TIMKEN

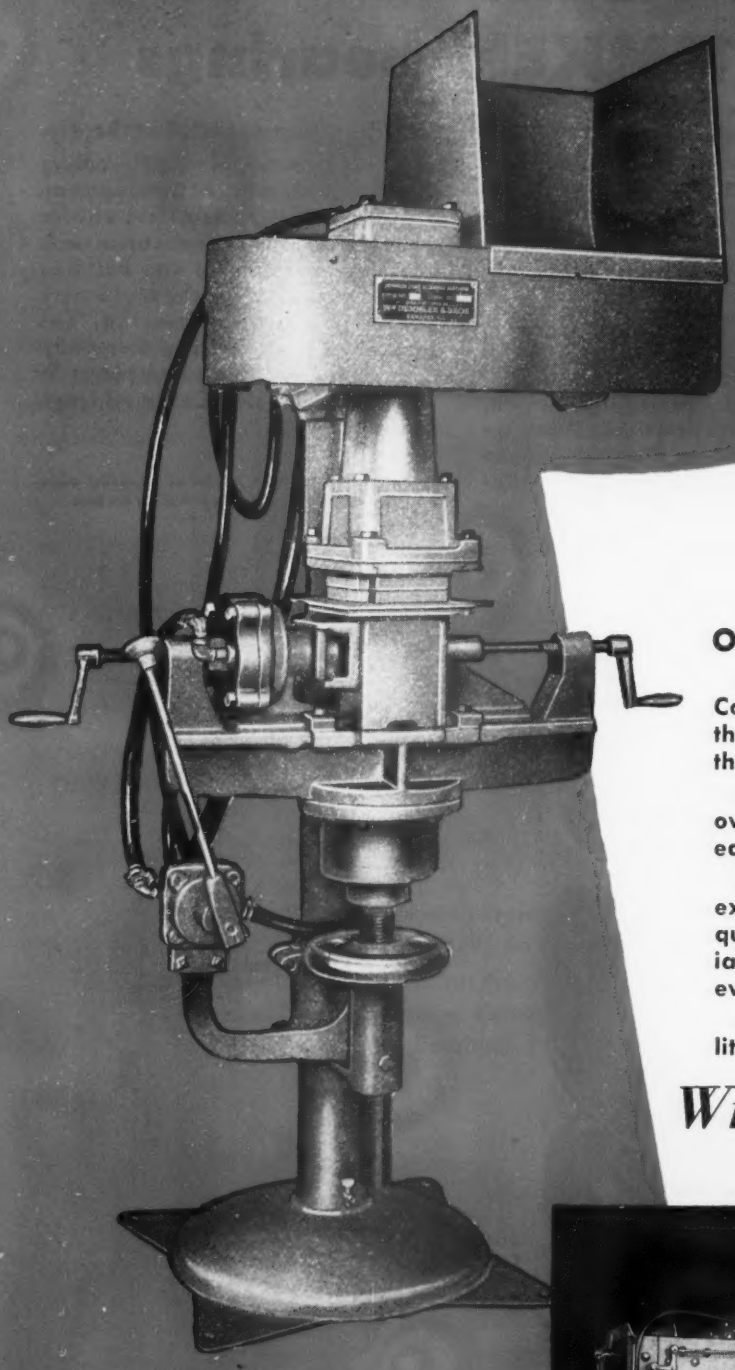
TRADE-MARK REG. U.S. PAT. OFF.

TAPERED ROLLER BEARINGS



NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ◫ AND THRUST ⊣◫⊢ LOADS OR ANY COMBINATION ✳

Profits Multiply...



DEMMLER
CORE BLOWERS

OFTEN COPIED — NEVER EQUALLED

Join the thousands who depend upon DEMMLER Core Blowers to assure them greater profits through an efficiency that sets the standards for the industry.

DEMMLER Core Blowers have led the field for over 40 years. They are often copied—never equalled!

Little wonder that Foundrymen have come to expect outstanding performance and matchless quality from every core blower bearing the familiar DEMMLER name. There's a machine to meet every core blowing requirement.

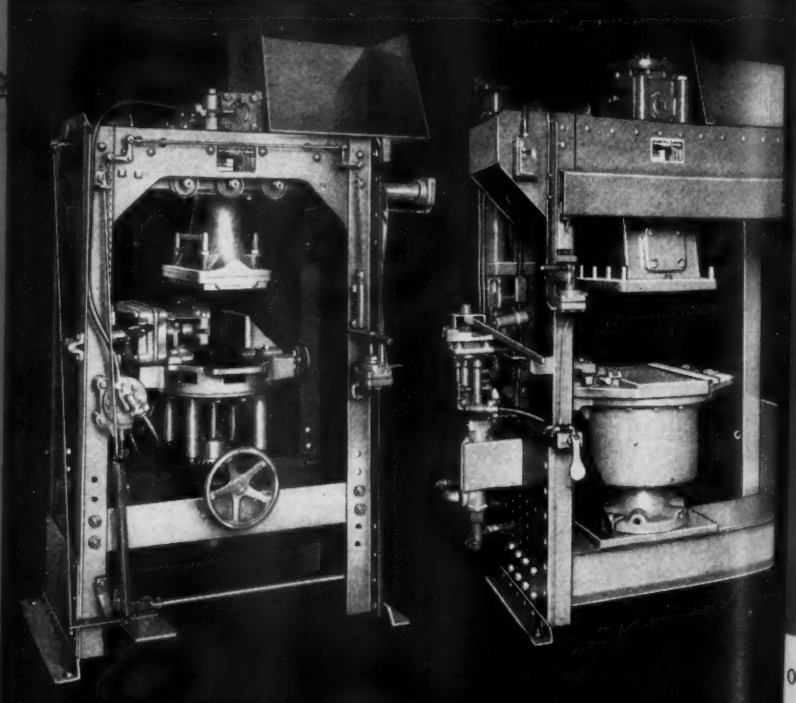
A letter stating your needs will bring descriptive literature promptly. Write today!

Wm.* DEMMLER *& Bros.

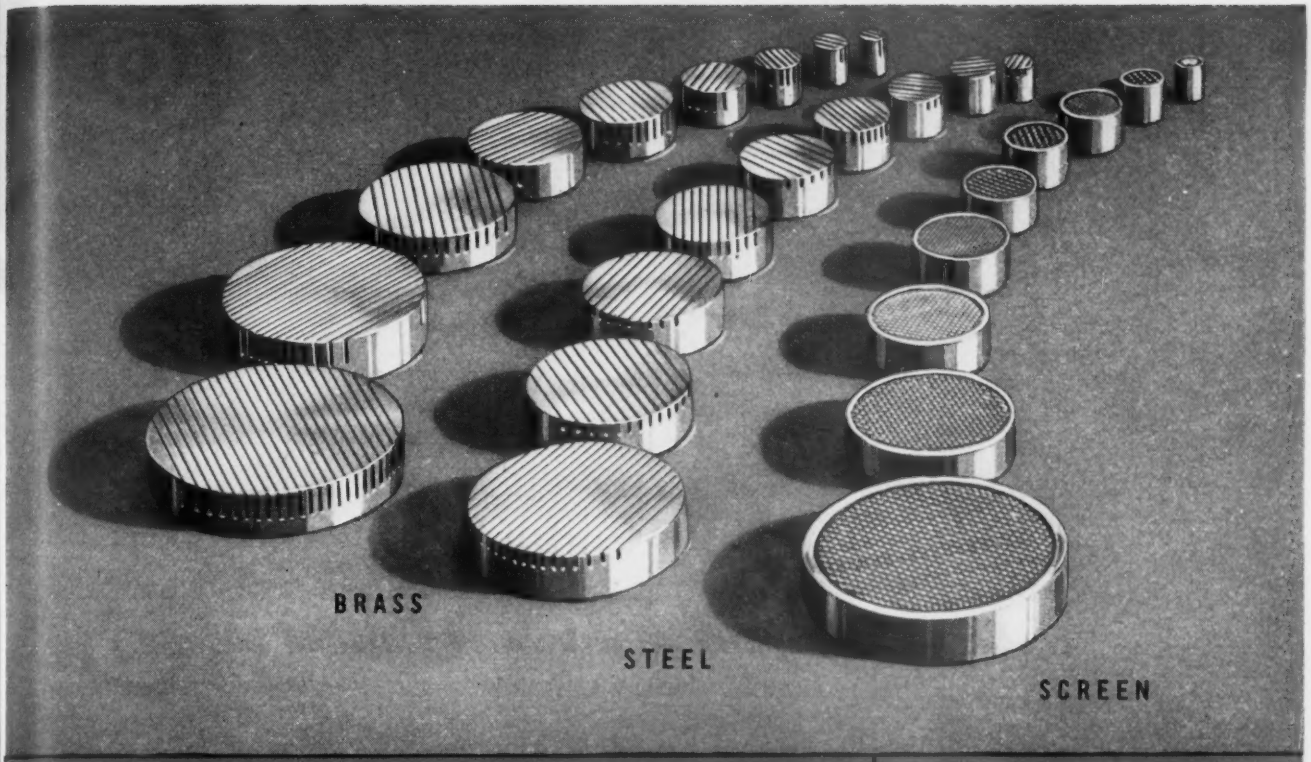
Kewanee, Illinois

DEMMLER NO. 55

MANUFACTURERS OF CORE BLOWERS EXCLUSIVELY SINCE 1911



DEMMLER NO. 1 DEMMLER NO. 3E



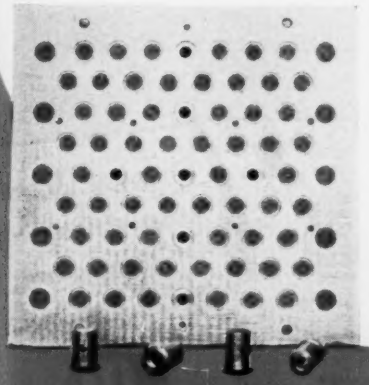
PRECISION CORE BOX VENTS BY

DEMMLER

You eliminate all guesswork when you use precision made DEMMLER Core Box Vents. These high-quality vents adhere precisely to specifications because they are precision built to close tolerances. In addition, DEMMLER core box vents possess great rigidity — are truly designed for practical foundry application.

Dependable, efficient, long-lived DEMMLER core box vents are available in brass slotted, steel slotted and screen types. Each of these types offer a wide variety of sizes to meet every application.

Always specify DEMMLER core box vents — you can count on them for quality far above ordinary standards.



UNIVERSAL BLOW PLATE

DEMMLER Universal Blow Plate consists of two plates with separators between, allowing the air from the core box to escape between the plates. The blow tubes and vent bushings are interchangeable so any hole in these plates can be used either as a blow hole or a vent. These plates are recommended for use only on open top, or half core boxes. They are manufactured in any size to suit the bottom dimension of the sand magazine.

Write for Illustrated Folder

WM. DEMMLER & BROS., KEWANEE, ILLINOIS

Manufacturers of Core Blowers Exclusively Since 1911

SPECIFICATIONS

BRASS SLOTTED CORE BOX VENTS

Slot Widths: .010", .013", .015"

Diameters: 1/8", 3/16", 1/4", 5/16", 3/8", 7/16", 1/2", 5/8", 3/4", 7/8", 1", 1-1/4", 1-1/2"

The brass slotted vents have thick heads, so that they may be used in round or curved core box surfaces, and the heads scraped to conform to the contour of the box. Very fine sand requires the use of vents with .010" slots, but .015" slots may be used, with the usual lake sand core mixtures.

STEEL SLOTTED CORE BOX VENTS

Slot Widths: .010", .013", .015"

Diameters: 1/8", 3/16", 1/4", 5/16", 3/8", 7/16", 1/2", 5/8", 3/4", 7/8", 1", 1-1/4", 1-1/2"

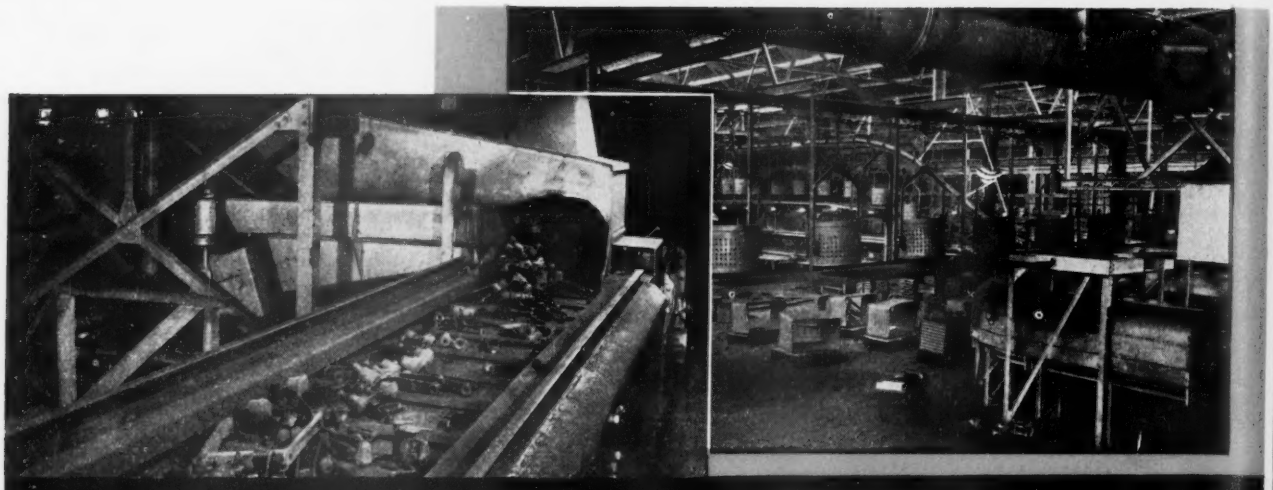
The steel slotted vents have thin heads, to make them easy to keep clean, and are preferable for use in flat surfaces of core boxes. They are hard chrome plated to prevent rust.

SCREEN TYPE CORE BOX VENTS

Mesh: #30, #40, #50

Diameters: 3/16", 1/4", 5/16", 3/8", 7/16", 1/2", 5/8", 3/4", 7/8", 1", 1-1/4", 1-1/2"

Screen type vents provide maximum ventilation, and are preferred by many of our customers for this reason. Coarse screen vents may be used in core prints, where it does not matter if the vent leaves a slight mark on the core. They are also useful in vented plates used under core boxes which are open at the bottom.



Volume increased by complete mechanization

No lost motion from cupola to finished product

These three views were taken in a recently-modernized Malleable Foundry . . . Jeffrey-equipped for non-stop production. Here is sand and casting handling at its best. We would like to tell you more about it.

Jeffrey Mold Conveyors, Trolley Conveyors, Belt Conveyors, Steel Apron Conveyors, Continuous Molding Stations and Electric Vibrating Feeders . . . all contribute to the success of this high-speed foundry operation. Write for more details . . . if you are looking for peak efficiency and increased volume.

THE JEFFREY MANUFACTURING COMPANY

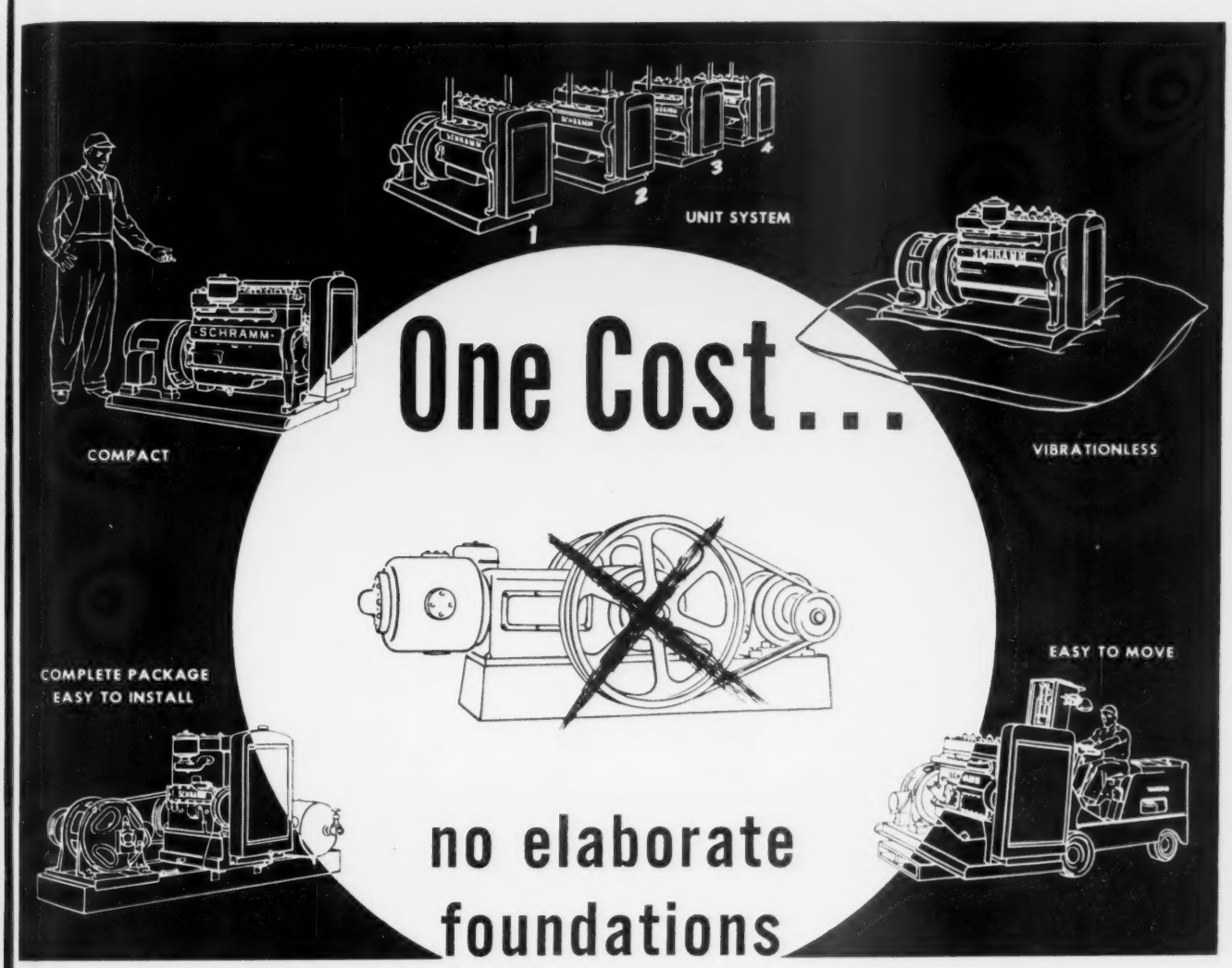
ESTABLISHED 1877

907 North Fourth St., Columbus 16, Ohio

Baltimore 2, Beckley, W. Va., Birmingham 3, Boston 16, Buffalo 2, Chicago 1, Cincinnati 2, Cleveland 15, Denver 2, Detroit 13, Forty Fort, Pa., Harlan, Ky., Houston 2, Jacksonville 2, Milwaukee 2, New York 7, Philadelphia 3, Pittsburgh 22, St. Louis 1, Salt Lake City 1

Jeffrey Mfg. Co. Ltd., Montreal, Canada
British Jeffrey-Diamond Ltd., Wakefield, England
Jeffrey-Galion (Pty.) Ltd., Johannesburg, S. A.
The Galion Iron Works & Mfg. Co., Galion and Bucyrus, Ohio
Galion (Great Britain Ltd.), Wakefield, England
The Ohio Malleable Iron Co., Columbus, Ohio
The Kilbourne & Jacobs Mfg. Co., Columbus, Ohio

Complete Line of Material Handling, Processing and Mining Equipment



WHEN INSTALLING THE MODERN

SCHRAMM AIR COMPRESSORS

Complete assembled SCHRAMM units are furnished with compressor and motor mounted on a substantial steel base, which can serve as a foundation. No deep pit foundation or time and expense consuming "built-up" concrete foundation is necessary.

En-Bloc construction is one of the many contributing factors to this feature in the SCHRAMM Modern Stationary Compressor. The single block casting contains all of the cylinders, the main crank shaft bearing supports, camshaft bearing supports and the complete lubricating system.

SCHRAMM Compressors are built for 24-hour continuous service, in sizes ranging from ⅓ to 100 horsepower.

Write for booklet C-50B for further information.

SCHRAMM INC.

The Compressor People

WEST CHESTER • PENNSYLVANIA

SCHRAMM, INC. • WEST CHESTER, PA.

Please send Free Booklet C-50 B on installing Stationary Air Compressors.

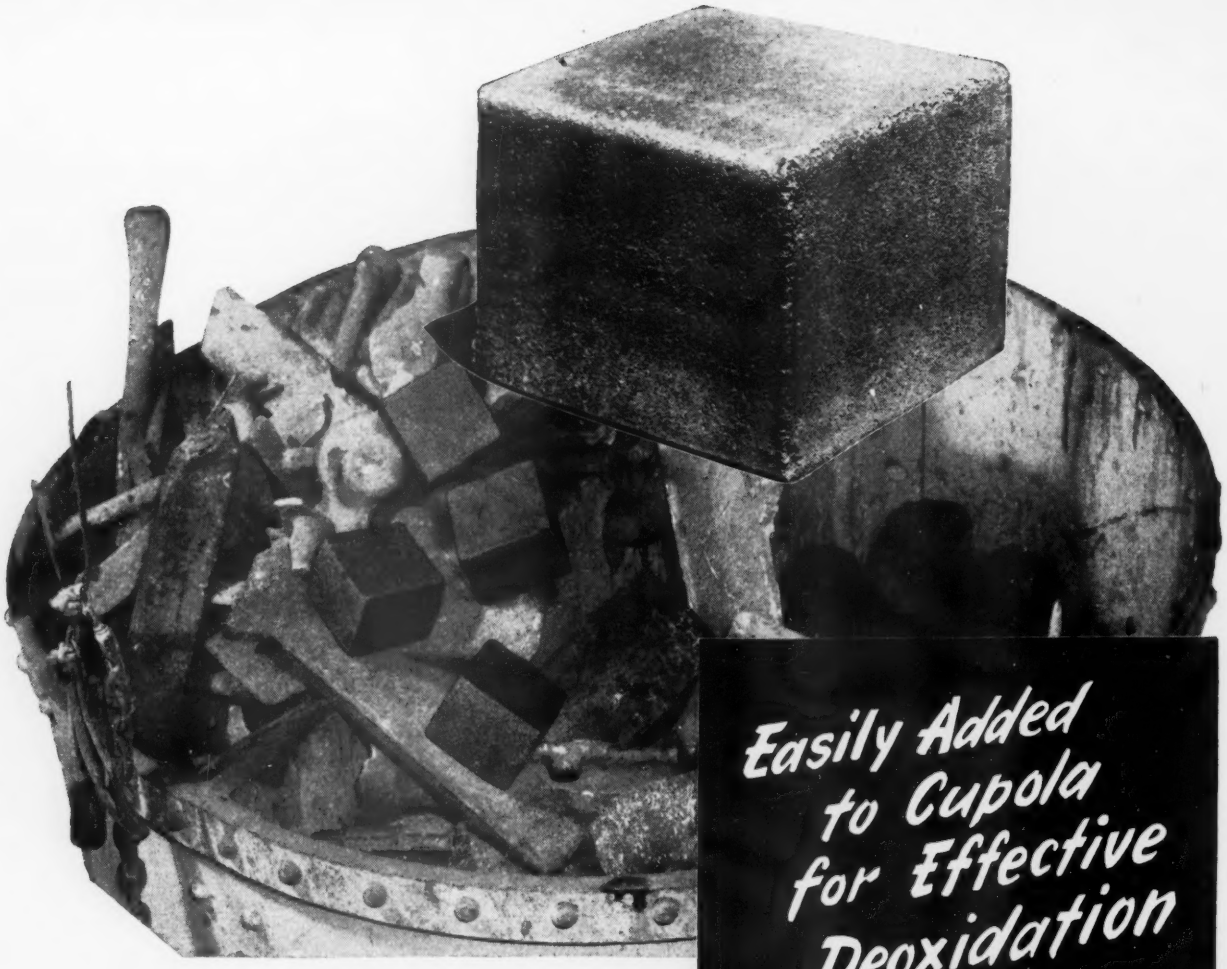
*Name*_____

*Title*_____

*Company*_____

*Street*_____

*City*_____ *Zone*_____ *State*_____



Easily Added to Cupola for Effective Deoxidation

FERROCARBO Briquettes by CARBORUNDUM are made from silicon carbide specially processed for metallurgical use—in a handy briquette size, for easy addition to the cupola charge. FERROCARBO Briquettes are readily soluble in molten iron, for thorough deoxidation... resulting in iron of prolonged fluidity, and cleaner, sharper castings.

FERROCARBO Briquettes

by CARBORUNDUM

TRADE MARK

Write or Phone our FERROCARBO Distributors:

KERCHNER, MARSHALL & CO., PITTSBURGH, Cleveland, Birmingham, Philadelphia and Buffalo
MILLER & COMPANY, CHICAGO, St. Louis and Cincinnati

● **FERROCARBO Briquettes** are manufactured under U. S. Patents 2,119,521 and 2,497,745. The process of making cast iron through utilization of silicon carbide is registered under U. S. Patent 2,020,171.

Made in Canada by the CANADIAN CARBORUNDUM COMPANY, LTD., Niagara Falls, Ontario
and Distributed in Canada by WILLIAMS & WILSON, TORONTO, Montreal and Windsor, *and by* KERCHNER, MARSHALL & CO., BUFFALO, N. Y.

"Carborundum" and "Ferrocarbo" are registered trademarks which indicate manufacture by The Carborundum Company, Niagara Falls, N. Y.

THE CUPOLA, *before using Famous Cornell Cupola Flux.*

THE CUPOLA *where Famous Cornell Cupola Flux is used.*

besides

CLEAN METAL, BETTER CASTINGS

you get an

Extra Dividend

through

INCREASED EFFICIENCY IN CUPOLA OPERATION and big reduction in down-time and maintenance, when you use

Famous CORNELL

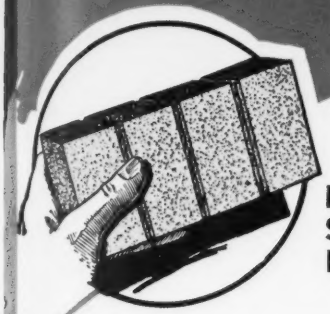
CUPOLA FLUX

For over thirty-three years, Famous Cornell Cupola Flux has minimized casting rejects by thoroughly cleansing molten iron and making it more fluid. Sulphur is greatly reduced, slag is kept fluid, and machining is easier.

KEEPS CUPOLAS CLEANER. LININGS LAST LONGER. Drops are cleaner and bridging over is practically eliminated. A glazed or vitrified surface is formed over brick or stone lining, reducing erosion. Cupola down-time for repairs and maintenance is reduced amazingly.

Used in outstanding gray iron foundries and malleable foundries with cupola operation.

WRITE FOR BULLETIN NO. 46-B



EXCLUSIVE SCORED BRICK FORM,

Takes but seconds to use, and there is no waste. You simply lift Famous Cornell Cupola Flux from container and toss it into cupola with each ton charge of iron, or break off one to three briquettes (quarter sections) for smaller charges, as per instructions.

Famous CORNELL BRASS FLUX

CLEANSES MOLTEN BRASS even when dirtiest brass turnings or sweepings are used. You pour clean, strong castings which withstand high pressure tests and take a beautiful finish. The use of this flux saves you considerable tin and other metals, and keeps crucible and furnace linings cleaner, adds to lining life and reduces maintenance.

The CLEVELAND FLUX Co

1026-1040 MAIN AVENUE, N. W., CLEVELAND 13, OHIO

Manufacturers of Iron, Semi-Steel, Malleable, Brass, Bronze Aluminum and Ladle Fluxes—Since 1918.

FAMOUS CORNELL FLUXES

Trade Mark Registered

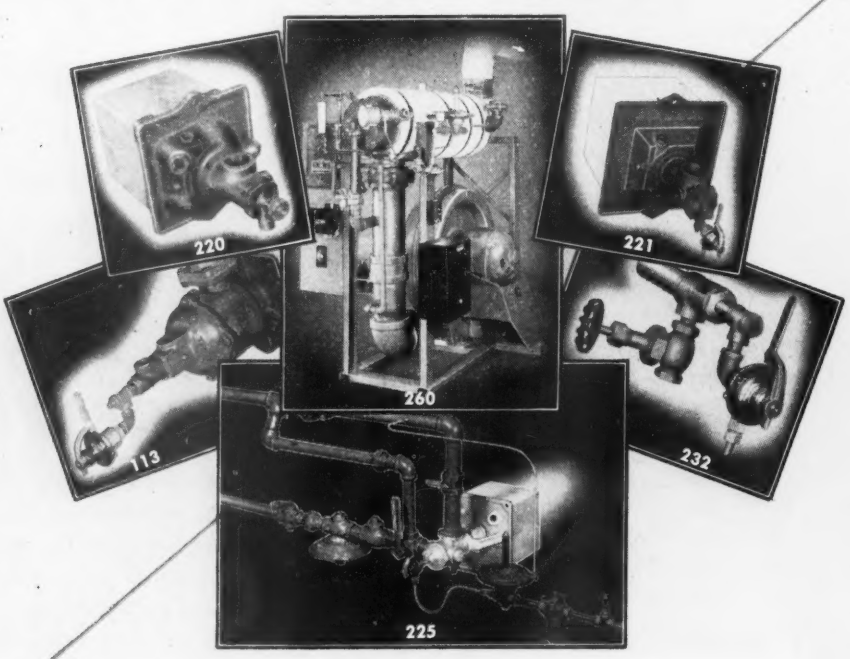
Famous CORNELL ALUMINUM FLUX

CLEANSES MOLTEN ALUMINUM so that you pour clean, tough castings. No spongy or porous spots even when more scrap is used. Thinner yet stronger sections can be poured. Castings take a higher polish. Exclusive Formula greatly reduces obnoxious gases, improves working conditions. Dross contains no

Peak Efficiency **either** *Gas or Oil* *with*

North American

Dual-Fuel Burners*



THE LINE IS *Complete*.....SELECT

THE BURNER YOUR OPERATING CONDITIONS REQUIRE

113—Long Flames. **220-221**—Short Flames, sealed-in mountings. **225**—For rugged duty, open or closed mounting, gas at zero. **232**—Compressed air atomizing oil inserts. **260**—Oiltogas Converter for burning oil as a gas in existing gas burners.

*Dual-Fuel: The North American name for burners designed especially for both gas and oil. Fuel changed by merely turning valves.

THE NORTH AMERICAN MANUFACTURING COMPANY

MANUFACTURERS OF INDUSTRIAL FUEL BURNING EQUIPMENT FOR GAS OR OIL

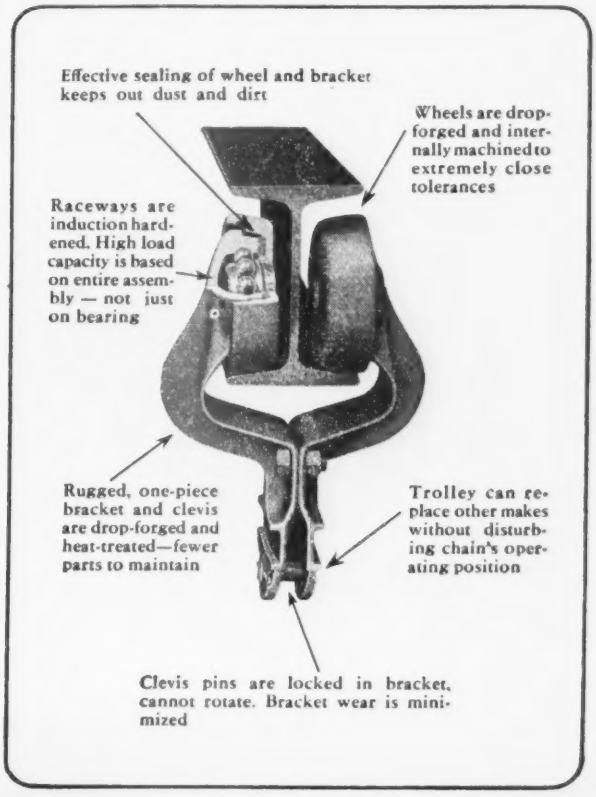
BRANCH OFFICES *with* FIELD ENGINEERS *in* PRINCIPAL CITIES

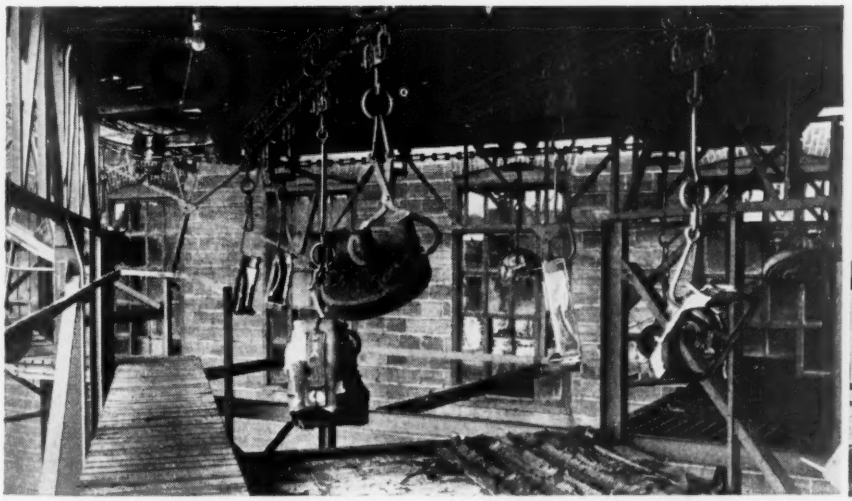
CLEVELAND 5, OHIO

When you buy TROLLEY CONVEYORS...

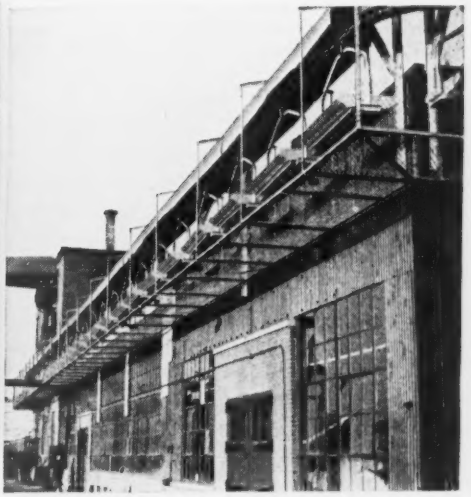
LINK-BELT GIVES YOU BOTH!

Superior components plus engineering ingenuity


Effective sealing of wheel and bracket keeps out dust and dirt
Wheels are drop-forged and internally machined to extremely close tolerances
Raceways are induction hardened. High load capacity is based on entire assembly — not just on bearing
Rugged, one-piece bracket and clevis are drop-forged and heat-treated—fewer parts to maintain
Trolley can replace other makes without disturbing chain's operating position
Clevis pins are locked in bracket, cannot rotate. Bracket wear is minimized



Section of a Link-Belt Trolley Conveyor in a steel gallery outside a large foundry upon which castings travel in order to cool properly. 1½ hours are required to complete this cooling circuit.



Smaller castings cool in pans carried by the Trolley Conveyor around this foundry building.

TRAVEL up, down and around at synchronized speeds. Straight-line production from shake-out to shipping, regardless of physical layout. Saving of floor space. Release of manpower for productive jobs.

You get all these outstanding production advantages with any well-engineered overhead trolley conveyor. But you get more—much more—when you specify Link-Belt!

Not only does Link-Belt make the most popular, the most advanced trolley on the market—you also tap industry's greatest source of materials handling and power transmission experience.

Put quality products plus engineering ingenuity to work for you. Our specialists will work with you and your consultants . . . help you set up smooth, steady, straight-line production in your plant.

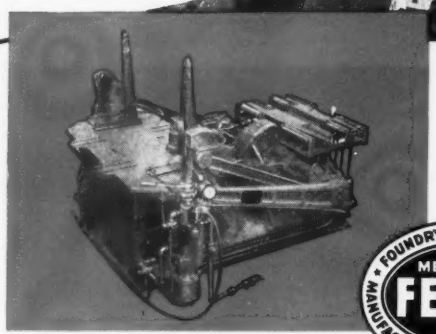
LINK-BELT

OVERHEAD TROLLEY CONVEYORS

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices in principal cities. 12,409

This Foundry IS A GOOD PLACE TO WORK

Farrell-Cheek Steel Co.



FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

Visitors to this 41-year old Sandusky, Ohio, plant see ample proof that it is a good place to work. Its up-to-date, well-kept buildings, modern equipment, locker and washrooms, canteens and other facilities are designed for employee welfare and comfort.

Covering 2 full city-blocks, Farrell-Cheek produces a wide variety of steel castings for road building machinery, power shovels, etc., as well as a specialty-line of stoker screws, chain and other items.

A full-time nurse is in attendance each day. Insofar as possible, all back-breaking manual labor has been eliminated by mechanized conveyors, sand handling systems, and other equipment. Elaborate dust collection apparatus is used. Concrete and wood floors are everywhere throughout the plant. Farrell-Cheek has an expert safety director in charge of employee and plant safety. Better than 10% of its 500 employees have been with the company for 25 years or more and 75% have been there 15 years or more.

Herman Molding Machines, like the 1500 lb. jarr rollover illustrated, are doing their share to help make Farrell-Cheek a good foundry in which to work. Approximately one minute is required to jarr, rollover and draw the pattern. All Hermans are safe and easy to operate, one rotary valve handle controlling the complete cycle.

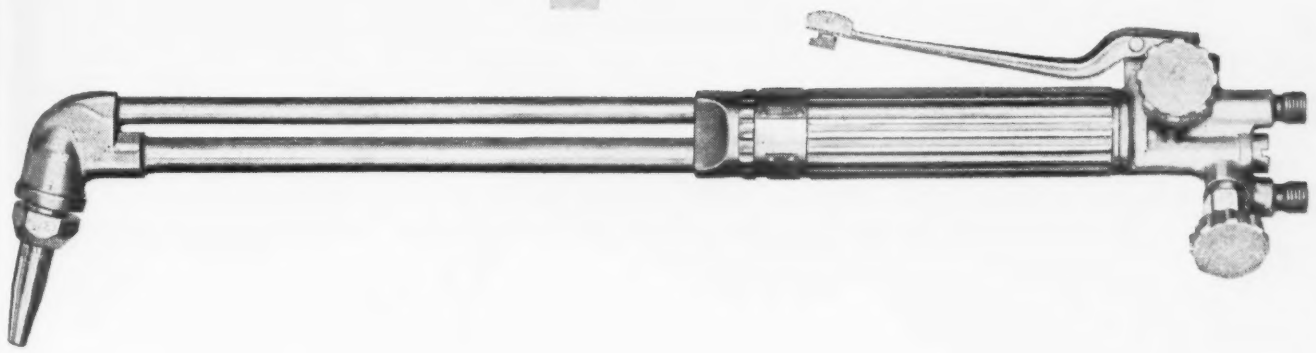
Of most importance, Herman Molding Machines have made their way by the way they're made.

Herman MOLDING MACHINES

HERMAN PNEUMATIC MACHINE CO., UNION BANK BUILDING, PITTSBURGH 22, PA.

Do all this with *One* OXWELD Trade-Mark Blowpipe

- **Cut steel up to 12 in. thick**
- **Bevel parts for fabrication or repair**
- **Gouge grooves of many sizes and contours**
- **Deseam semi-finished steel forms**
- **Cut risers and "wash" pads**
- **Prepare plate edges for welding**
- **Remove rivets and pierce holes**
- **Trim plate and structural shapes**
- **Powder-cut stainless steels and other oxidation-resistant metals**
- **Cut guided circles and straight lines**
- **Scrap obsolete equipment for profit**



Whether your work includes one or more than one of these jobs, the OXWELD C-32 Blowpipe will save you time and money. This all-purpose cutting blowpipe, with its wide variety of inexpensive nozzles and attachments, easily handles these jobs—and many others—with outstanding efficiency, speed, and convenience.

Like all OXWELD products, the C-32 is built to give you many extra years of economical and **trouble-free service** under every condition of use. Available in your choice of 3 lengths (20-, 26-, and 32-in.) and 3 head angles (75-, 90-, and 180-deg.) to suit your exact needs. Write or phone today for full information about this cutting blowpipe — or regarding welding blowpipes, regulators, cutting machines, or acetylene generators.

The terms "Linde" and "Oxweld" are registered trade-marks of Union Carbide and Carbon Corporation.

Linde Trade-Mark

LINDE AIR PRODUCTS COMPANY
A DIVISION OF UNION CARBIDE AND CARBON CORPORATION
30 E. 42nd St., New York 17, N. Y. UCC Offices in Other Principal Cities
In Canada: DOMINION OXYGEN COMPANY, LIMITED, Toronto

CASTFLUX — The 'National' DUAL-PURPOSE FLUX

TYPE SB-10

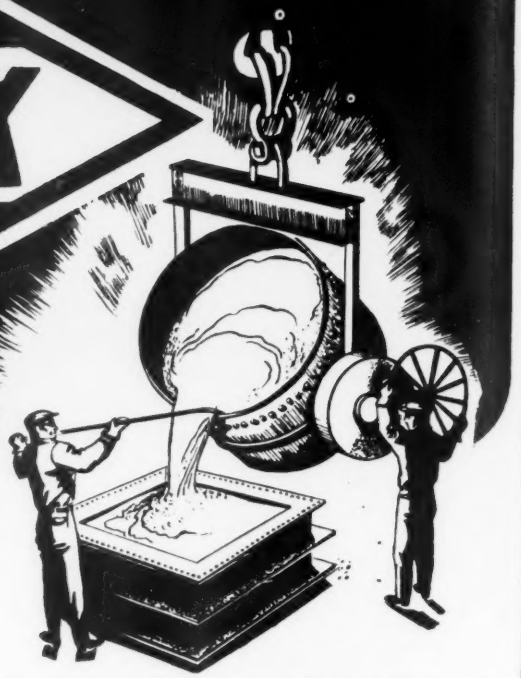
virtually produces

NO *Smoke*
NO *Fume*

it is partly **EXOTHERMIC • DEOXIDIZING • INSULATING**

CASTFLUX

Trade Mark Reg.



unconditionally
GUARANTEED

*unless CASTFLUX SB-10 meets with your full approval, material can be returned at no expense within 30 days.

on blind and open RISERS

CASTFLUX raises the temperature of the metal to a higher degree and substantially increases and maintains the fluidity of the metal during the entire cooling-down period.

as a 'HOT TOPPING'

CASTFLUX prevents oxidation by keeping the molten steel down into the main body of the ingot, greatly reducing the volume of piping and saving a substantial amount of metal. There is no carbon segregation or pick-up.

in the LADLE

CASTFLUX increases fluidity materially by cleansing and purifying the metal; bringing to the surface occluded oxides, gases, slag, dirt, and other foreign matter; offsetting the negative factors of inferior scrap and coke.

Place a trial order for
CASTFLUX SB-10
to prove these laboratory findings. You risk no money.*

. . . a nationally known, recognized research laboratory reports, "There is absolutely no carbon pick-up at the neck of the riser or casting when CASTFLUX SB-10 is used on steel and steel alloys." It is a partly exothermic compound, for feeding heads and risers, that virtually does not smoke or create fume. Its uniformity has been well established in the industry. As a LADLE addition it is a wonderful liquidizer—through its cleansing action it deoxidizes and de-gasifies the metal. That CASTFLUX SB-10 increases the yield, improves production at considerable savings has been proved by leading foundrymen and acclaimed by foundries, large and small, and steel mills the world over.

NATIONAL pigment co.

2115-2117 EAST YORK STREET
PHILADELPHIA 25, PA.

for **1.** Assured Core Support **2.** Maximum Fusion **3.** Freedom From Leakers **4.** Accurate Wall Thicknesses *use*

The ALL-NEW GROOVESTEM

FEATHEREDGE FUSION RINGS

Knife-like multiple Rings heat instantaneously to fusion temperatures—burning in and eliminating leakers.

COMPLETE CONTACT RADIUS GROOVES

Molten metal lays up solidly against the rounded bases of the radius grooves. Greater chaplet area contact results in maximum fusion. No sharp threads to trap gases or weaken stem strength.

COUNTERSUNK SHOULDERS

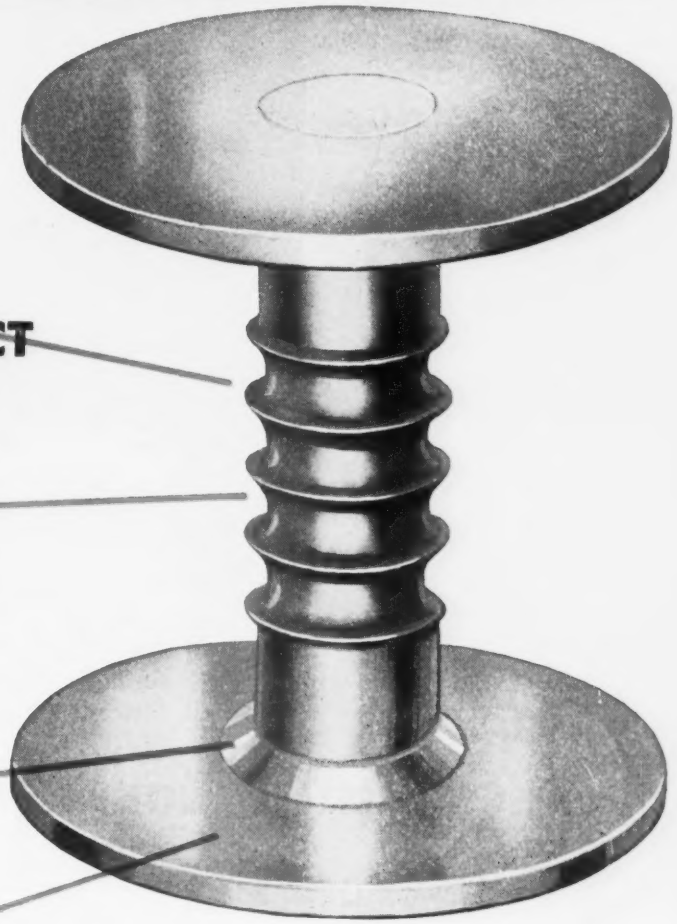
Heavy tapered shoulders provide solid support to plates—allow full contact with molten metal. No sharp angles to create voids usually formed under heads of ordinary chaplets.

TIN OR COPPER COATED

Either is a sure protection against rust, and actually aids fusion. Each readily alloys with iron or steel lowering melting point, thus improving fusion.

PRECISION TOLERANCES

Held to plus or minus .002 on most sizes, Fanner reputation for accuracy is unequalled.



Patent Pending

For 57 Years Fanner Chaplets have been the standard of excellence in the foundry industry. In an effort to produce an even better chaplet, The Fanner Manufacturing Company commissioned the Battelle Memorial Institute, Columbus, Ohio, to conduct *exhaustive studies of chaplet design.* Based on these studies, supplemented by field tests in leading foundries, Fanner Manufacturing Company has developed the new Groovestem chaplet, further insuring the maximum in core support and completeness of fusion.

FANNER MFG. CO., CLEVELAND 1, OHIO

In Canada: CANADIAN FANNER, LTD., Hamilton, Ont., Canada

THREE CENTS!

That's all it costs to hire this practical foundry specialist!

● A three-cent stamp—that's all it takes to get the years of practical experience and extensive technical knowledge of the Republic Pig Iron Metallurgist, the man who is paid by Republic to work for you, the pig iron user.

If it's a particular production problem on which you need prompt assistance, you can depend on help in a hurry from the Republic Pig Iron Metallurgist. Or if it's a less urgent matter—even a routine survey of the molding practices which you are using—you can count on him to pay you a visit the next time he's in your neighborhood.

The cost? Outside of your original three-cent stamp, not one penny! The only obligation is his—and it is to help you. Drop us a line today . . . let us know when you would like him to call.

REPUBLIC STEEL CORPORATION
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Dept.: Chrysler Building, New York 17, New York

Republic PIG IRON

"CHATEAUGAY" Low-Phosphorus, Copper-Free

"REPUBLIC" (Northern) Foundry, Basic and Malleable

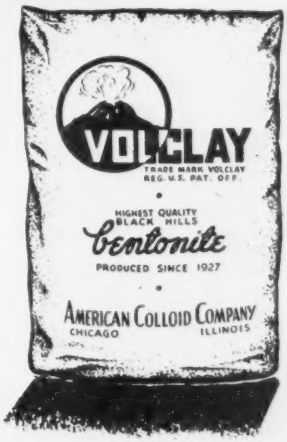
"PIONEER" (Southern) Foundry and Basic

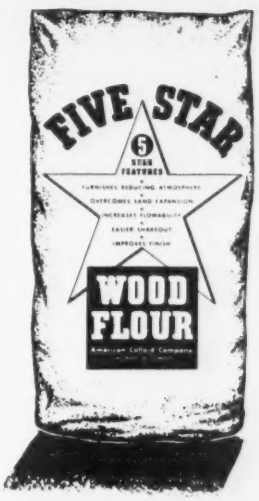
REPUBLIC STEEL

Brief Notes for Busy Foundrymen

Do "Whistlers" Really Act as Some Foundrymen Believe?

- *Whistlers are more common to the "old time" or "early" molder.*
- *He learned when he had bosses, small projections* on the casting in the cope, or any extension in the cope above the main body of the casting, that "blows" or "shrinks" could develop unless whistlers were added.
- *It was his belief that by adding a whistler* the gas in the mold would escape through the whistler and therefore relieve the gas pressure, which he thought caused the tiny concave defects that at times appeared in these bosses.
- *No thought was given to whether the whistler acted as a chill.*
- *In other words* if a cast iron chill was placed on these bosses, the defect may have disappeared even though it was called a "blow". If the cast iron chill did overcome this defect, *how could it possibly be a "blow"*, as the cast iron chill had no permeability or porosity to relieve the gas pressure?
- *Studying the problem, could it be that the whistler acted as a chill?* Could it be that these small projections of metal ran into the cope and froze almost immediately, thus acting as heat conductors to the rest of the casting?
- *Could it be that they even acted as feed bobs?* In many of the early foundries, where this practice was adopted, it was found that they were always seeking higher yield values and there was most generally a lack of feeder heads or risers.
- *It has always been questionable if the whistler really relieves the gas pressure,* or if it acts as a chill to the casting, thus overcoming a shrink rather than a blow.
- **Any comments?**





VOLCLAY Western Bentonite • FIVE STAR Wood Flour • PANTHER CREEK Southern Bentonite

AMERICAN COLLOID COMPANY Chicago 54 Illinois • Producers Since 1927

Available from Leading Foundry Suppliers in the United States and Canada

If cores are your responsibil y

The Crucible Steel Casting Corporation produces 150 runner cups per hour on the San-Blo core blower, (shown in photograph) an 87% increase over their previous method. The machine is a DeLuxe Model, with automatic clamping (6" table stroke) and horizontal clamp attachment.

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION MEMBER FEMA

The **FEDERAL FOD**

4600 EAST 71st S

CHICAGO DETROIT MILWAUKEE NEW YORK CHATT RICH

...il you should read this letter!

CRUCIBLE STEEL CASTING CORPORATION

Electric Steel Castings

2850 SOUTH TWENTIETH STREET
MILWAUKEE 15 · WIS ·

June 21, 1951

Mr. Elmer Ditty
Federal Foundry Supply Co.
4600 East 71st Street
Cleveland 5, Ohio

Dear Mr. Ditty:

We are very happy to give you the report on the Federal San-Blo machine. At present we are using it exclusively for making runner cups. We formerly made these runner cups on a small jolt roll-over machine. Our production on this particular machine was 80 cores per hour. Since we have put this job on your San-Blo machine, we have increased our production to 150 cores per hour.

We are also very much impressed with the performance of this machine, as we are able to use various types of sand, which we were not able to do with our other core blowing machines.

Thank you for the splendid service you have given us and also the cooperation from your sales representative, Mr. Ted Meagher.

Yours very truly,

CRUCIBLE STEEL CASTING CORPORATION

M. A. Karrer

M. A. Karrer, General Superintendent

MAK:CD

Write for bulletin CB-2. Contains full information on the sensational SAN-BLO core blower. Explains new core blowing principle and how it is boosting core production. Specifications on Bench, Floor and De Luxe Models. Case histories. Accessory data

ODRY SUPPLY *Company*

t S · CLEVELAND 5, OHIO

CHATT RICHMOND LOS ANGELES CROWN HILL, W. VA. UPTON, WYO.

THIS MONTH, 62,562* BUYERS OF CASTINGS WILL READ THIS AD...

This is one of a series of 6 full page ads emphasizing the expanding industrial acceptance of Brass Castings. Nationally circulated in outstanding trade journals and read by manufacturers, engineers, contractors, metallurgists, production control men—*these messages reach the men who specify and influence the purchasing of castings!*

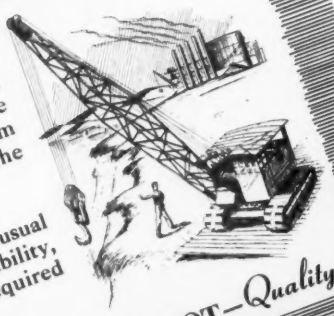
R. Lavin & Sons, Inc.

MODERN INDUSTRIAL DESIGNERS KNOW..

Bronze Gears Retain Their Physical Properties Under Constant Usage

Bronze gear wheels are a *must* when used with hardened steel worms in speed reducing systems. The bronze gear teeth maintain their correct form due to the regenerating action of the hardened worm.

Only in bronze can be found the unusual combination of plasticity, durability, strength and wear resistance required for this type of service.



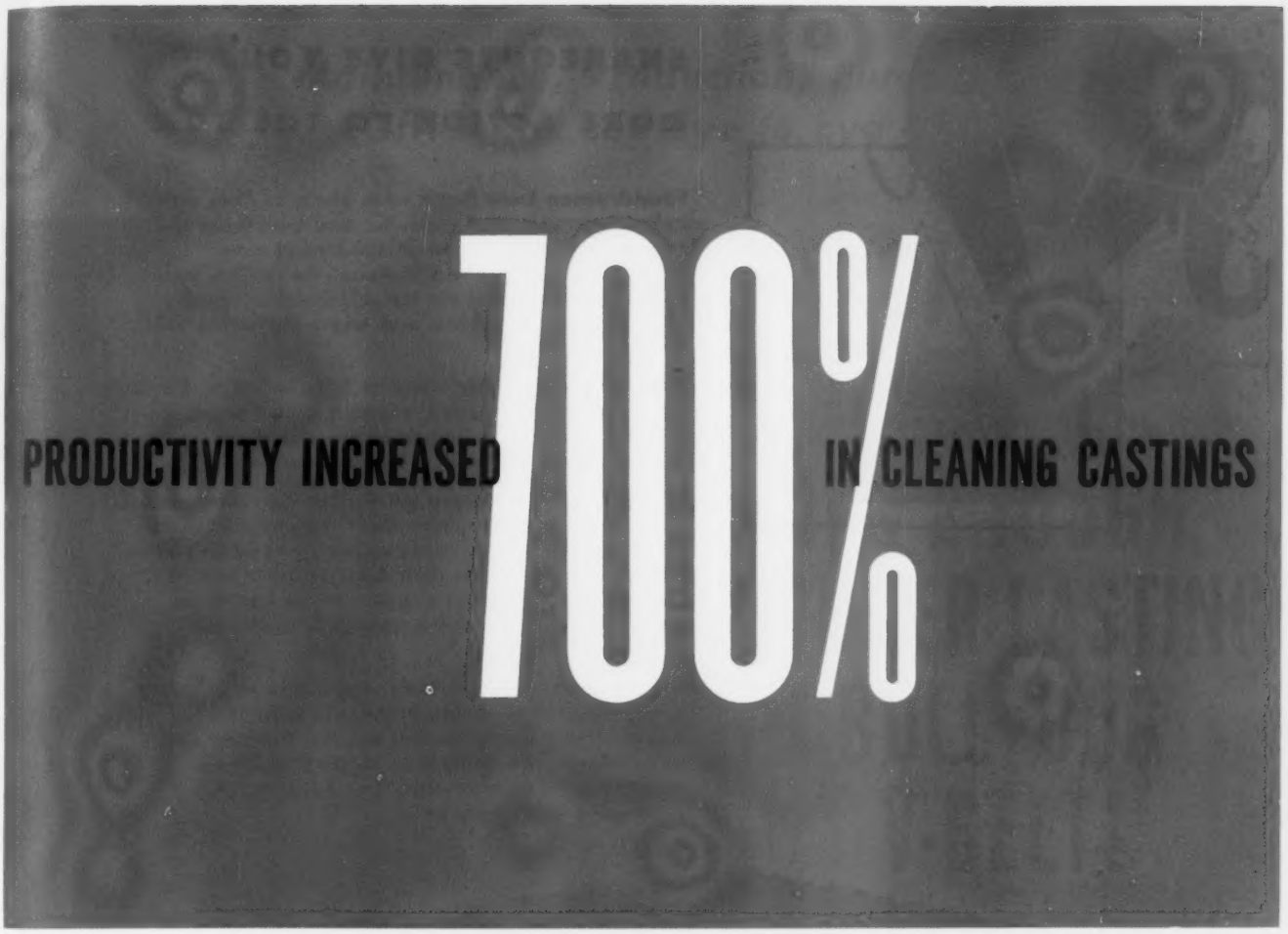
Specify—LAVIN NON-FERROUS INGOT—*Quality*

R. LAVIN & SONS, INC.
Refiners of Brass, Bronze and Aluminum
3426 SOUTH KEDZIE AVENUE · CHICAGO 23, ILLINOIS
REPRESENTATIVES IN PRINCIPAL CITIES

REPRINTS OF ENTIRE *Brass Castings* SERIES ARE YOURS FOR THE ASKING

The Foundryman's Problems . . . Are Our Problems!

* Audited Circulation plus pass-on readership.



with WHEELABRATOR®

AIRLESS BLAST CLEANING

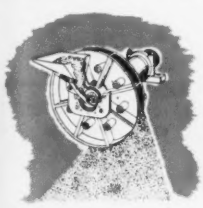
GENERAL METALS CORPORATION, Los Angeles, California, cleans four times the quantity of malleable castings with half the labor since installing two Wheelabrator Tumblasts. One man operating both units now handles 400 tons a month whereas two men formerly handled only 100 tons monthly with a battery of tumbling mills and airblast rooms.

CLEANING COSTS CUT 59%—Cleaning costs per ton have been reduced from $8.41 to $3.40 to effect a yearly savings of $24,048.00.

CHIPPING AND GRINDING ELIMINATED — Chipping and grinding have been eliminated entirely because of the thoroughness of Wheelabrator cleaning. Inspection is faster and more thorough. Because the castings are cleaner, customers of the General Metals Corp. report they are saving over 50% in tool life.

SPACE SAVED—The Wheelabrator replaced a battery of tumbling mills and airblast rooms requiring excessive valuable floor space. Because there is no backlog of castings awaiting cleaning, additional space is saved.

YOU SAVE TIME, MONEY AND MANPOWER when you clean by Wheelabrating. An expert analysis of your cleaning problems by one of our engineers will give you complete facts on the results Wheelabrating will provide. There's no obligation, of course. Write for details.

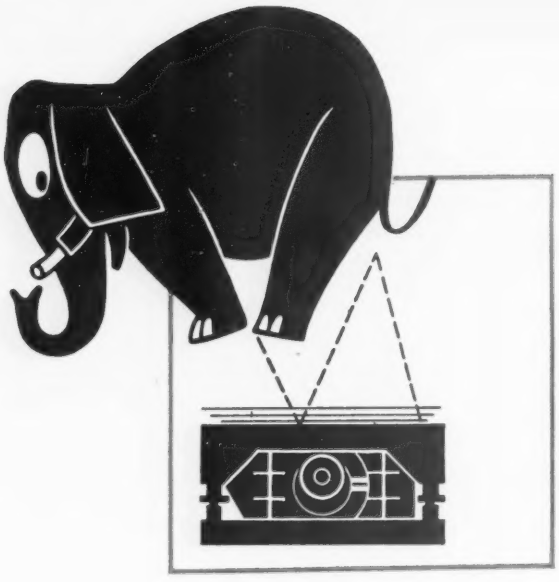


WHEELABRATOR—The perfected airless centrifugal blast unit pioneered by ***American*** slashes cost and cleaning time. Conserves power, labor, space. Cleaning perfection results in longer tool life, faster machining and grinding, easier inspection.

American

WHEELABRATOR & EQUIPMENT CORP.
505 S. Byrkit St., Mishawaka 2, Indiana

WORLD'S LARGEST BUILDERS OF AIRLESS BLAST CLEANING EQUIPMENT



SIMPLICITY SPRING-MOUNTED SHAKEOUTS GIVE YOU MORE ACTION TO THE TON

Foundrymen know that it takes plenty of "live action" to knock out cores and shake the sand from flasks and castings that sometimes weigh 100 tons or more. Simplicity Spring-Mounted Shakeouts do this job thoroughly in less time because of the controlled vertical action that's concentrated at the deck where the action will do the most good.

Simplicity's controlled vibration is the secret. In Simplicity Spring-Mounted Shakeouts, vibration is confined to the deck alone. The rigid supporting structure of the shakeout will not vibrate even with a light foundation.

Up on the live deck, you get positive controlled vertical action because of Simplicity Shaft Design and Special Corner Snubbers. This means absolutely no casting travel towards one end of the deck — a dangerous hazard if the casting or flask slips its chains. Flasks last longer and more important, casting damage is completely eliminated.

The massive deck and body construction of Simplicity Spring-Mounted Shakeouts insures dependable operation and lasting service, cuts maintenance costs to a minimum. Available in all larger sizes for use as single units or in combination. For complete information write today to . . .

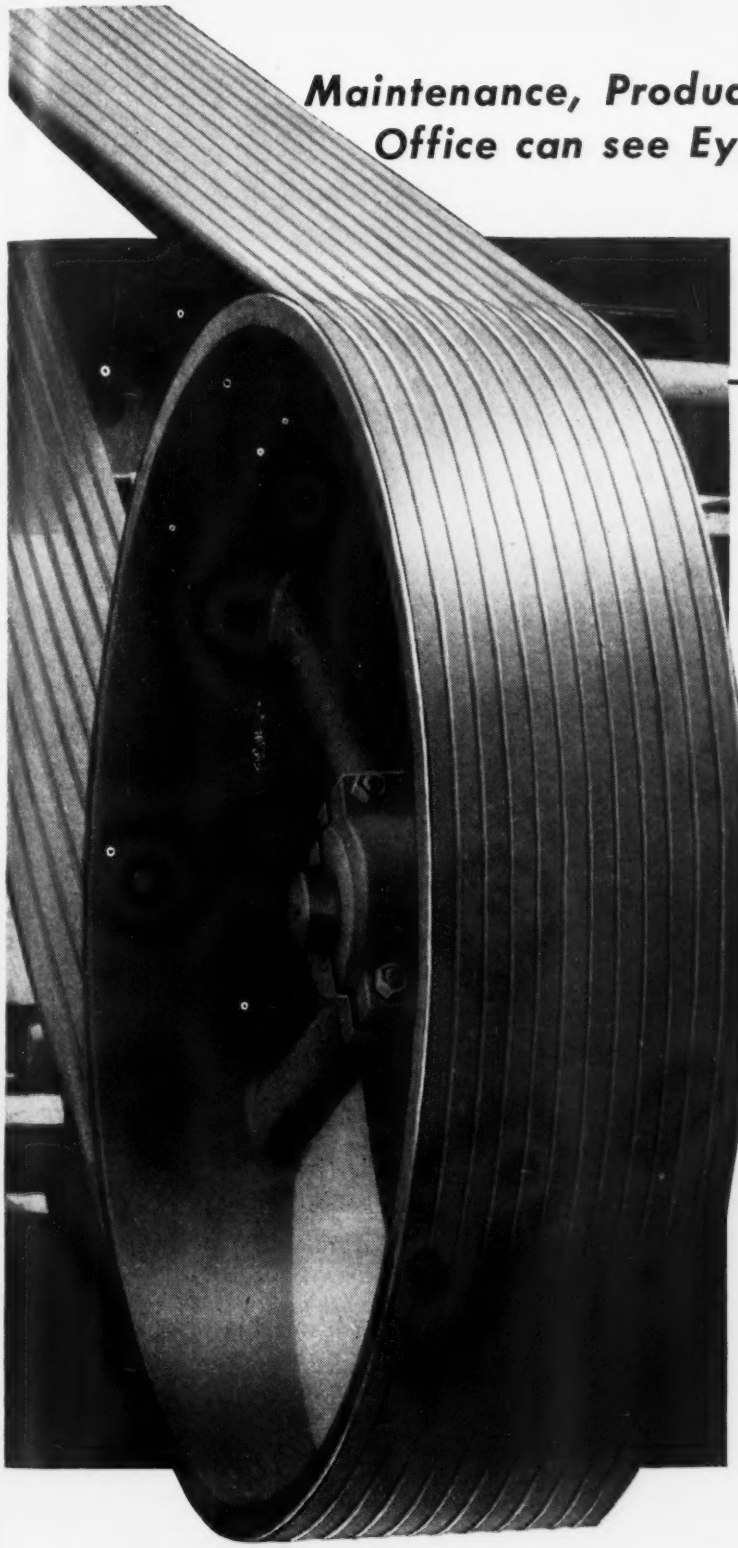
Simplicity 8' x 10' Model OA Special Spring-Mounted Shakeout

- **Sales Representatives In All Parts Of The U.S.A.**
- **For Canada: Canadian Bridge Engineering Company, Ltd., Walkerville, Ontario**
- **For Export: Brown & Sites, 90 Church Street, New York 7, N. Y.**

99

Simplicity
TRADE MARK REGISTERED

ENGINEERING COMPANY • DURAND, MICHIGAN



Maintenance, Production, Purchasing and Front Office can see Eye to Eye on this "Baby"

It's a TOUGH, LONGER-LASTING BULL DOG V-BELT!

Yes, a Bull Dog V-Belt has something for everybody. Your engineers and production heads who have enough on their minds already with shortages and the necessity for increased output will appreciate the SPECIALLY ENGINEERED BWH CORD SECTION and its high tensile strength. They'll get the superior load carrying capacity from BULL DOGS and the ability to absorb shock loads that's needed.

Your maintenance men (engineers, too) will note the QUALITY CONTROLLED COMPOUNDS developed by BWH which run cooler and do not crack or deteriorate under severe flexing. They'll probably note also the MINIMUM STRETCH — due to a new and exclusive technique in processing Bull Dog Cords. They'll be *sure* to note the less slippage, fewer adjustments, longer belt life that results.

Your maintenance men will also okay the Bull Dog V-Belt's DURABLE COVERS. They're made of closely woven, heavy, bias-cut fabric that takes the torturous wearing action where the belt meets the sheave — seals it against the penetration of dirt, grease and moisture.

With it all adding up to less money *out* in belt repairs and replacements and more money *in* from maintained and increased production . . . don't you think Purchasing and the Front Office will be glad to go along?

BWH
DEPENDABLE RUGGEDNESS

TOUGH PROBLEMS INVITED!

Ask us or your nearest BWH distributor about your power transmission belting, conveyor belting or hose problems. We're specialists in making mechanical rubber products work *better, longer.*

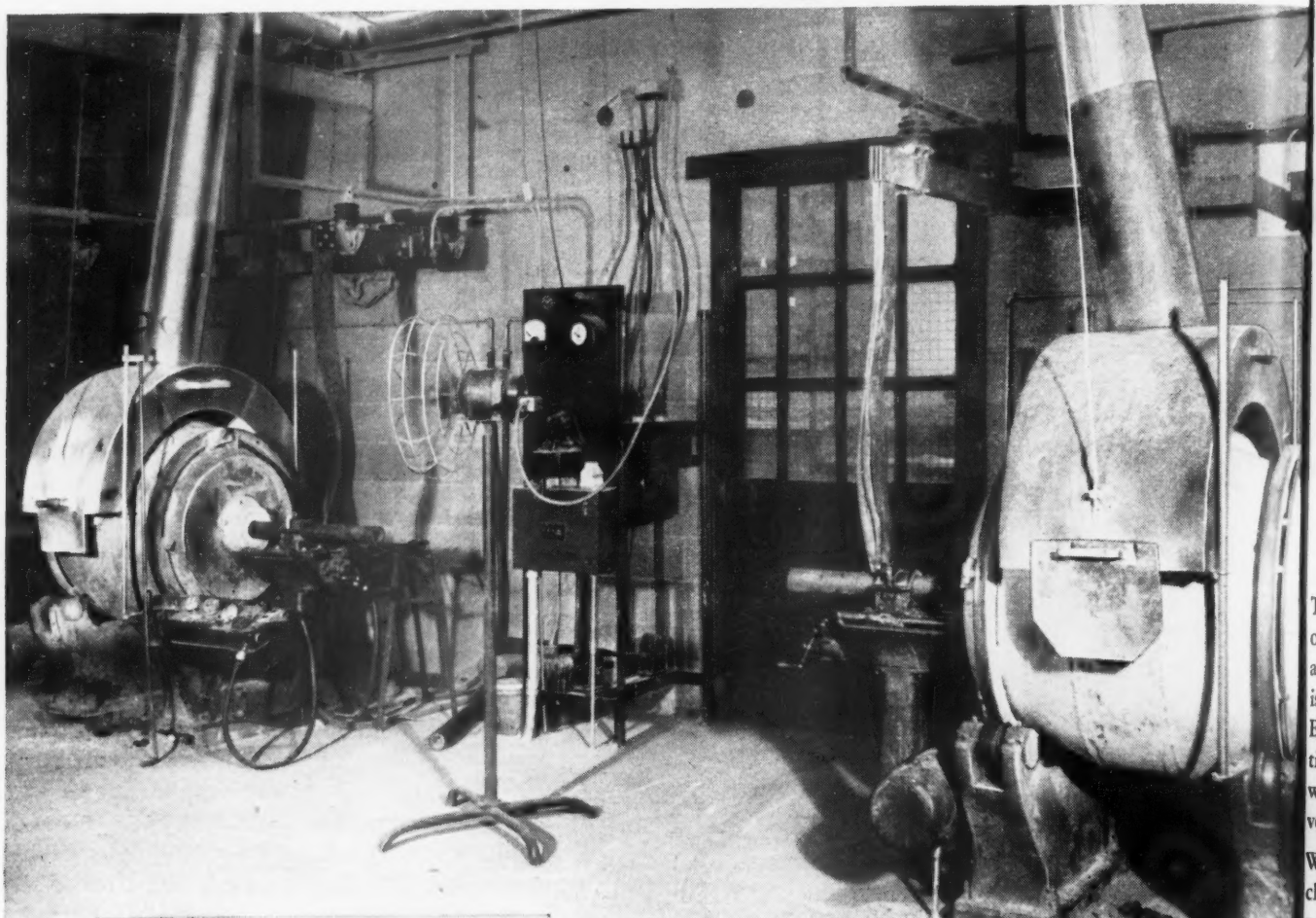
Another Quality Product of

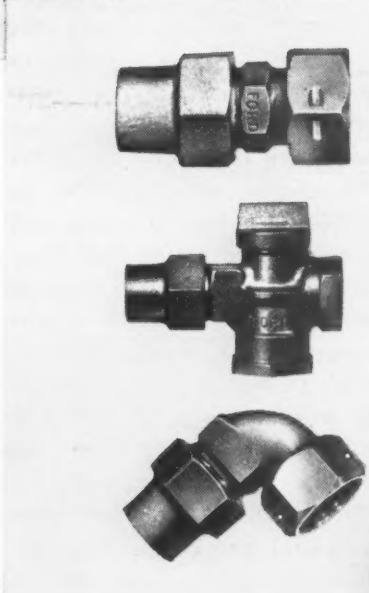
BOSTON WOVEN HOSE & RUBBER CO.

Distributors in all Principal Cities

PLANT: CAMBRIDGE, MASS. • P. O. BOX 1071, BOSTON 3, MASS., U. S. A.

Better Castings and a





▲ *Two 350 lb. Type LFC Detroit Rocking Electric Furnaces melt all brass used at Ford Meter Box Company, Wabash, Indiana. Note ventilating hoods, clean installation.*

◀ *Ford valves and couplings are shown in panel at left. These brass articles are typical of the many cast from DEF metal at Ford Meter Box Company.*

◀ *The double-lid water meter boxes, left, are one of the types of installations made by Ford for municipalities from coast to coast. This is for outdoor use.*

Cooler, Cleaner Foundry

DETROIT ROCKING ELECTRIC FURNACES

are the answer at this progressive Midwest company

To beat corrosion, Ford Meter Box Company uses a lot of brass in the manufacture of settings, valves, couplings and adapters for water meter boxes. All this red brass is melted efficiently and economically in two Detroit Electric Furnaces, and castings are made in an exceptionally clean, comfortable foundry department, in which furnaces and casting operations are completely ventilated.

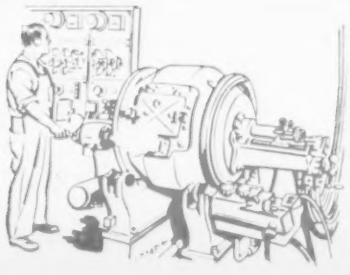
With Detroit furnaces, melt analysis is controlled to very close variations, with metal of the desired characteristics produced by each heat. Accurate temperature control, too, follows the pattern of fastest, most efficient operation. The rocking action of Detroit furnaces assures homogenous melts, and—because of the washing action of the molten metal over the lining—a more complete utilization of generated heat.

Detroit Rocking Electric Furnace advantages are many and important: Positive control of composition and quality, less metal shrinkage, more efficient use of power, more heats per day, less out-of-production time because of easy shell replacement.

Furnaces have capacities from 10 to 4000 lbs., individually designed for your electrical specifications.

Want high operating economy, high quality melts and castings? Get full information on Detroit Rocking Electric Furnaces. Write today!

Faster melts, better melts



ROCKING ACTION DOES IT!

DETROIT ELECTRIC FURNACE DIVISION

KUHLMAN ELECTRIC COMPANY, BAY CITY, MICHIGAN

Foreign Representatives: In BRAZIL—Equipamentos Industrias "Eisa" Ltd., Sao Paulo, CHILE, ARGENTINA, PERU and VENEZUELA: M. Castellvi Inc., 150 Broadway, New York 7, N. Y., MEXICO: Casco, S. de R. L. Atenas 32, Despacho 14, Mexico City, D. F.

5 TON LOADS *Easily Handled with* MOTOR-DRIVEN CRANES

Inexpensive Cleveland Tramrail cranes like this make easy work of lifting and moving 5 ton loads. Completely motorized, these smooth running cranes are operated by a pendant push-button station.

Cleveland Tramrail Cranes also are built for cab control or manual operation to suit practically any working conditions.

Regardless of what your materials handling problems are, most likely Cleveland Tramrail engineers can help you do the work faster, easier and at lower cost.

GET THIS BOOK!
BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy

CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
3807 EAST 284TH ST., WICKLIFFE, OHIO

CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT

I've re-ordered B&W ALLMUL FIREBRICK

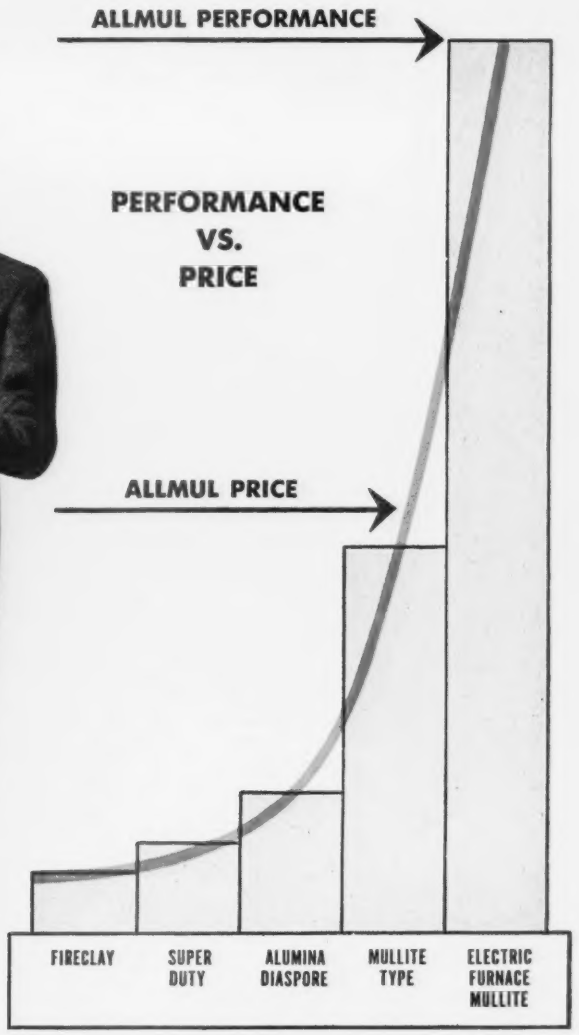
That's what scores of users are saying about B&W Allmul . . . the new, remarkable, electric-fused mullite firebrick. In plant after plant, Allmul has been *re-ordered* for such severe service applications as ferrous and non-ferrous melting furnaces, slag melting furnaces, butt-weld furnaces, glass tanks, checker chambers, ceramic kilns and many others. *That's proof of performance.*

There are two good reasons for the welcome Allmul has received. The first is its *price.* Mass-produced by a special, highly efficient process, top-quality Allmul comes to you at a price far lower than you would expect. For concrete evidence, look at the performance-price ratio charted at right.

The second reason is *staying power.* The panel below gives facts and figures . . . shows why no other firebrick in Allmul's price range can match its performance. In fact, no mullite brick at any price can better the performance of Allmul.

If you are not yet saving money with B&W Allmul, may we suggest you investigate this important new firebrick immediately. The sooner you start using Allmul, the greater your ultimate savings will be. SEND FOR NEW BULLETIN R-29.

ALLMUL is another important refractories development by B&W engineers who have continuously established new standards in industrial furnace refractories for the past 30 years.



CHECK THE PROPERTIES OF ALLMUL!

Here's how B&W Allmul stood up under standard tests.

SPALLING—12 cycles of heating to 2550F and chilling in cold air and water spray. **Result--no loss.**

HOT LOAD DEFORMATION—1½ hours at 3050F under load of 3600 pounds per square foot. **Result—less than 2% deformation.**

PERMANENT VOLUME CHANGE UNDER REHEATING—After 5 hours at 3200F. **Result—less than ½% change.**

FACT—no other firebrick in Allmul's price range can match its performance. **Fact**—no mullite brick at **any** price can better the performance of B&W Allmul.

BABCOCK & WILCOX

THE BABCOCK & WILCOX CO.
REFRACTORIES DIVISION
GENERAL OFFICES: 85 LIBERTY ST., NEW YORK 6, N.Y.
WORKS: AUGUSTA, GA.

R-395

B&W REFRACTORIES PRODUCTS — B&W Allmul Firebrick • B&W 80 Firebrick • B&W Junior Firebrick • B&W Insulating Firebrick B&W Refractory Castables, Plastics and Mortars • OTHER B&W PRODUCTS—Stationary & Marine Boilers and Component Equipment... Chemical Recovery Units . . . Seamless & Welded Tubes . . . Pulverizers . . . Fuel Burning Equipment . . . Pressure Vessels . . . Alloy Castings

GET MORE POWER PER POUND WITH THE NEW *360 CYCLE* TOOLS

Rotor's new line of 360 Cycle Tools gives you:

More power, less weight . . . nearly twice the power of 180 cycle tools with the same size of motor . . . more than four times the power of universal electric tools per pound of weight.

High speed under load . . . Rotor 360 Cycle Tools slow down only about 5% under full load, compared to 20% for pneumatic tools and 45% for universal tools.

Result: Lower costs through increased production. Ask the Rotor Analyst to explain how the New Rotor 360 Cycle Tools also mean *lower installation cost and lower power cost.*

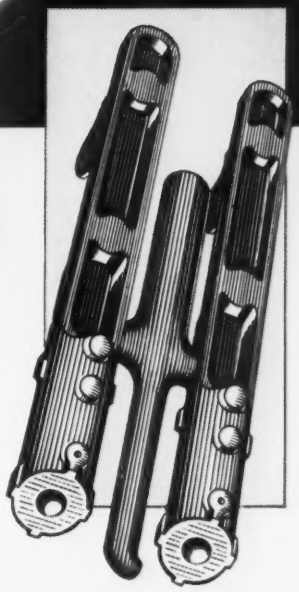
Write for a free copy of Bulletin 36 describing this new Rotor line of grinders, sanders, buffers and polishers.

360 CYCLE O'TOOL

THE ROTOR TOOL CO.

CLEVELAND, OHIO

UNBIASED ANALYSIS OF PORTABLE TOOL PROBLEMS



Precision Castings at Green Sand Cost!

You can now produce high-quality castings to tolerances of .002 to .003 of an inch *at green sand casting costs* while eliminating, or greatly reducing, finishing operations.

With the new Shell-Molding Process, using THOR Phenolic Resins, you make shell-thin, smooth-surfaced sand molds which permit casting closer to specifications at higher metal yields, cutting scrap loss and producing smoother-surfaced, sounder castings that have better machinability.

What's more, you accomplish this at a saving in equipment, space and labor which means increased income. Shell-Molding requires only about 5% the sand used in conventional practice. Hence, you save on sand, sand-handling and sand-conditioning. Requires less space, therefore, gives greater productivity per square foot. Lightweight shell-molds make it practical to transport molds to the molten metal.

From practical experience with this new process, we believe you can make a better casting, at lower cost, in less time with THOR Phenolic Resins using Shell-Molds.

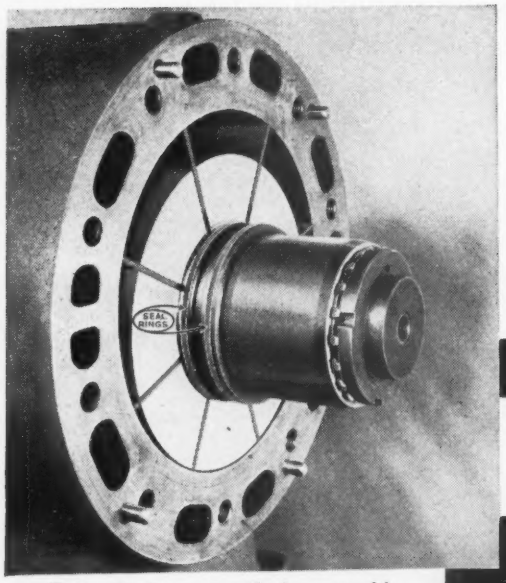
For detailed information mail the coupon below

Borden's
CHEMICAL DIVISION
350 Madison Avenue
New York 17, N. Y.

Please send me your booklet, "What You Should Know About The New Shell-Molding Process".

The Borden Company
Chemical Division, Dept. F-101
350 Madison Avenue
New York 17, N. Y.

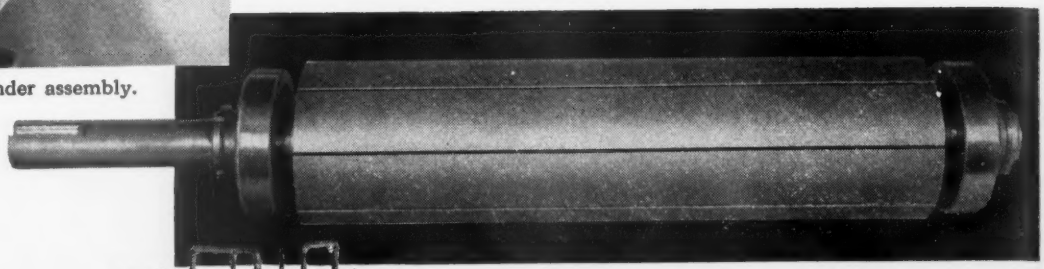
NAME.....
COMPANY.....
ADDRESS.....
CITY.....ZONE....STATE.....



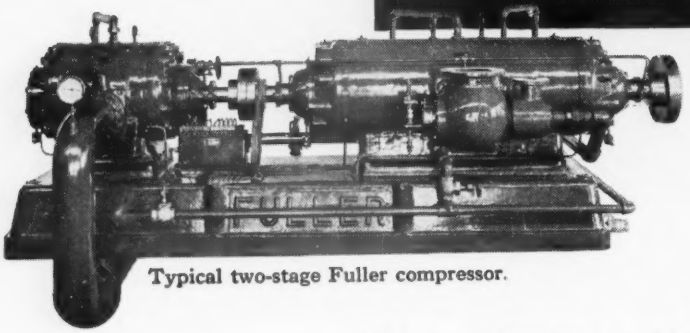
Rotor blades and cylinder assembly.

a lot of maintenance men have never seen inside a

FULLER COMPRESSOR



Accurately balanced, steel rotor with bearings mounted.



Typical two-stage Fuller compressor.

Rotor . . . bearings . . . blades—the only moving parts in a Fuller Rotary Compressor. There you have the three reasons why these compressors keep out of the repair shop. Fuller's efficient "heart" is your guarantee of economical and dependable service.

These are some of the important advantages of the Fuller Rotary—the reasons why thousands of these compressors are quietly and efficiently working for industry today: steady flow—no air-line pulsations, no valves to leak, direct drive from electric motor or internal combustion engine, simple foundation and small floor space, **maintained** capacity and efficiency for the life of the machine.

Whether your requirements call for a single-stage, two-stage or duplex combination, Fuller has the compressor **(to 125 psi. and 3300 cfm)** that will do the job better—longer. Investigate the Fuller Rotary Compressor. Complete information is given in Bulletin C-5. It's yours for the asking.

Fuller

DRY MATERIAL CONVEYING SYSTEMS AND COOLERS • COMPRESSORS AND VACUUM PUMPS FEEDERS AND ASSOCIATED EQUIPMENT

FULLER COMPANY
Catasauqua, Pennsylvania
Chicago 3—120 So. LaSalle St.
San Francisco 4—420 Chancery Bldg.

C-217

Make Better Castings

WITH *HERCULES*® NVX AND TRULINE® BINDER

Foundries everywhere are finding that Hercules NVX and Truline Binder are helping them to make better castings.

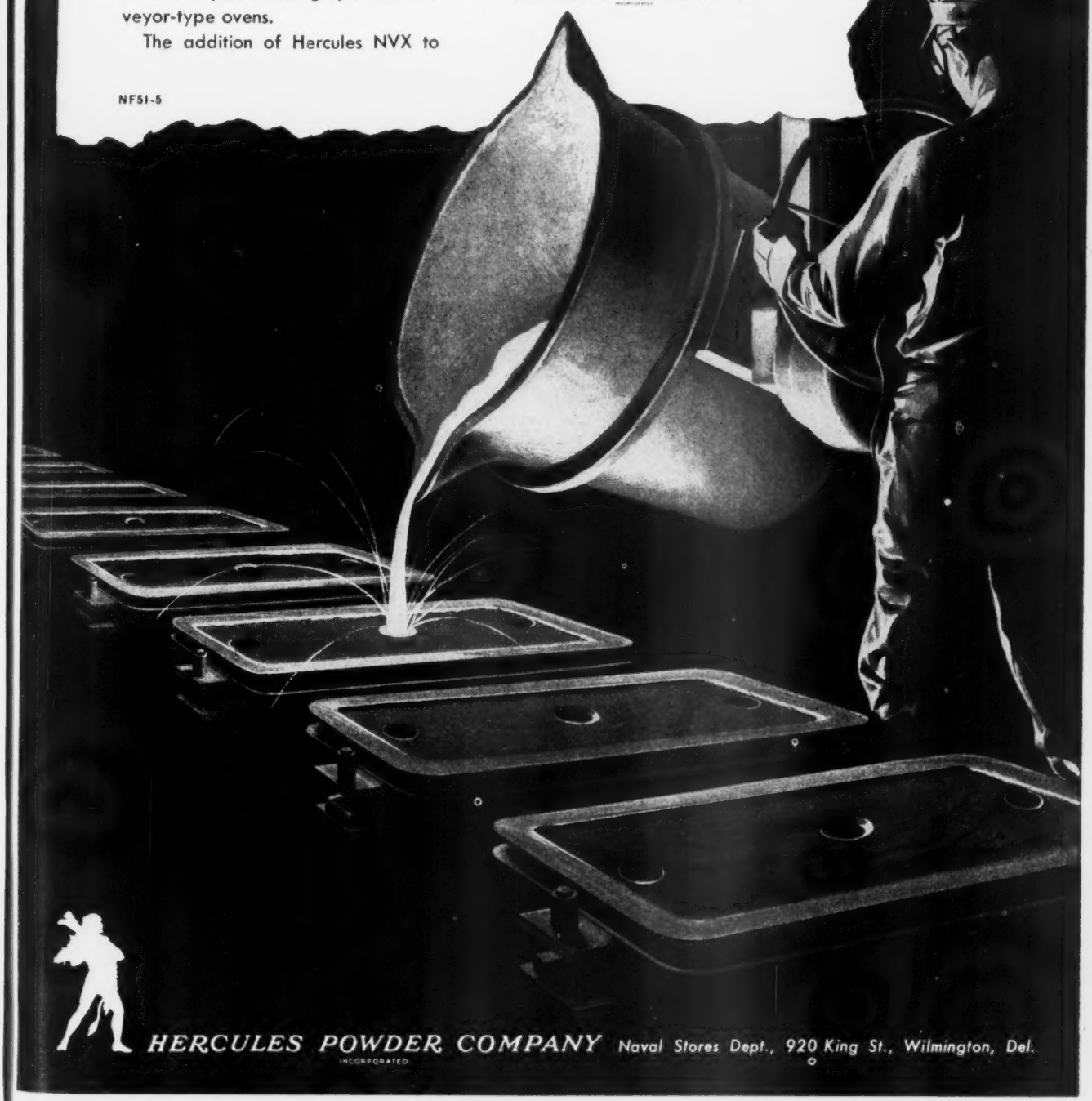
Use Truline Binder in your core mixes and you'll cut cleaning time up to 50% . . . because Truline-bonded cores burn out quicker, collapse easier and shake out fast. You'll also cut core baking time and speed baking cycles in conveyor-type ovens.

The addition of Hercules NVX to green sand facings—as little as ½ of 1% by weight—gives you smoother mold surfaces. You'll get cleaner castings, save time and money on finishing, and get better flowability, as well as better working sand.

All the facts—plus generous testing samples—are yours upon request to:

HERCULES POWDER COMPANY

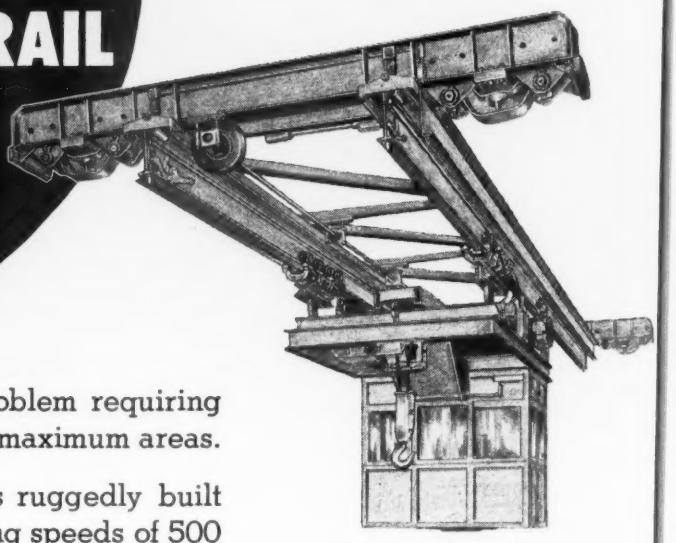
NF51-5



HERCULES POWDER COMPANY INCORPORATED Naval Stores Dept., 920 King St., Wilmington, Del.

Fast Operation · Constant Service with the NEW AMERICAN MONORAIL CRANES

Double Bridge Crane shown above is 118 feet long—operates at 500 feet per minute under constant service requirements.



Here is the solution to the handling problem requiring frequent movement of heavy loads over maximum areas.

This new American MonoRail Crane is ruggedly built to handle loads up to 10 tons at operating speeds of 500 feet per minute. Articulated trolleys assure perfect alignment of trucks for smooth crane travel.

With this crane you get fast, constant service not only on the craneways but also through adjacent areas by way of interlocking MonoRail systems.

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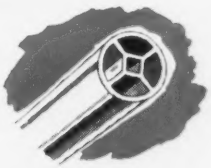
or extrusion  problem is yours for the

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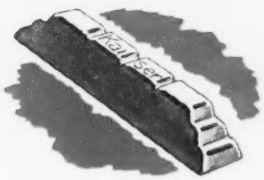
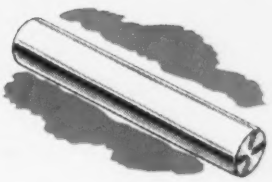
ingot  or extrusion billets 

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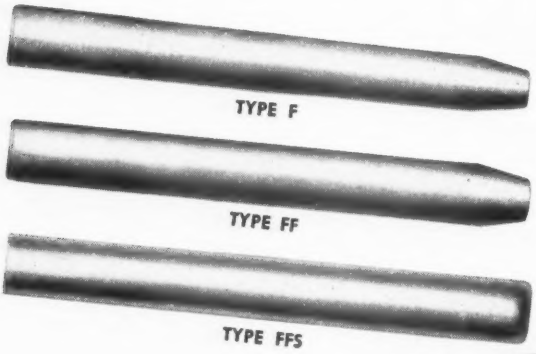

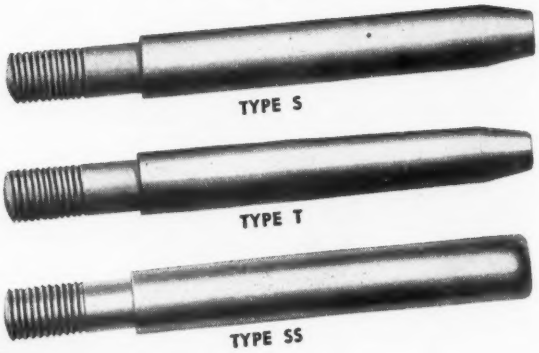

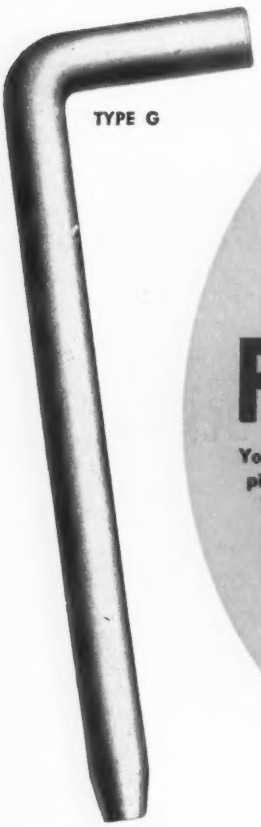

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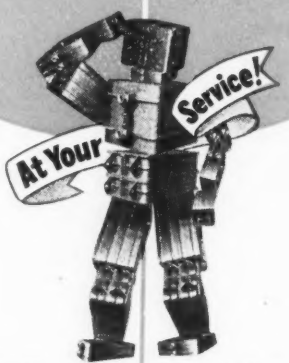
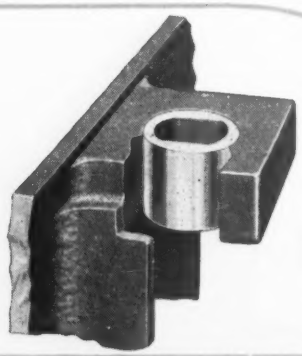
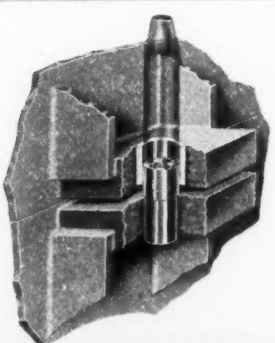




Hardened Steel Bushing as Installed in Flask.

Stub Pin in Drag Lug; Bushing in Cope Lug.



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A Permanent Foundation

GROWTH of the Foundry Educational Foundation since its establishment in 1947 has far exceeded the modest results that were anticipated by the founding fathers. Because a definite need existed, and these men of vision developed a plan based on sound principles, the extent and tangible results of the program have been most gratifying.

Importance of FEF services to the foundry industry is well illustrated in some statistics on 1951 accomplishments. Foundries secured 365 college graduates during the year, although a 300 yearly total was not expected until 1957. With 275 foundries asking for summer workers, the foundation assisted in placing 507 college undergraduates in the industry for further training during the recent vacation period. During the year 4112 students in the FEF-sponsored schools carried on studies in one of the 70 courses which were offered.

The promising work of the foundation in developing a foundry educational program on a national scale has struck a responsive chord among many engineering schools. As a result of interest of these institutions, FEF sponsorship has been enlarged from the original six schools and now includes fourteen. In five years these fourteen schools spent approximately $1 million improving their foundry laboratory facilities, of which over $900,000 was supplied by the schools and $80,200 by the foundation. The bulk of FEF funds has been used for scholarships.

But the intangible results probably are of even greater value to the industry. Attention created by the foundation program has caused engineering schools to take a better look at the value of castings as engineering materials. In the sponsored schools, as well as in many others throughout the country, undergraduate engineering students are learning of the tremendous possibilities offered by properly designed and well made castings. Such information in the hands of engineers cannot help but have a healthy influence on the marketing of castings when the present emergencies have passed.

Operation of the foundation was financed during the past five years through two industry-wide fund raising campaigns. While the response to these efforts was satisfactory and many donations were generous, the trustees have recognized the need for greater permanence in the membership structure. For that reason, a new plan is being introduced which will finance the FEF work through annual contributing members within the foundry and related industries. Additional funds may be provided by special contributions, gifts, grants and endowments.

There can be no doubt that the foundry industry has benefited from the first five years of FEF operation far in excess of the money invested.

The need for engineers in foundries will continue to grow. At the same time, greater acceptance of castings as important engineering materials is essential.

For these reasons, every foundry should support the permanent activities of FEF through an annual contributing membership.

Frank G. Steinebach
Editor

Fig. 1—Statue of Seth Boyden in Newark, N. J., honors the father of the malleable iron industry and one of the country's greatest inventors

Malleable

THE

IN FRANCE, in 1722, Rene Antoine Ferchault de Reaumur described the process of making European white-heart malleable iron castings and received credit for being the inventor of the "white-heart" malleable process. A century later, in 1826, at Newark, N. J., Seth Boyden, trying to make white-heart malleable, produced instead a greatly improved malleable which came to be known as "American Malleable Iron."

Boyden, a native of Foxboro, Mass., and the nearby furnace town of Easton, had settled in Newark, in 1815 at the age of 27. Apparently, an interest in harness-making led to his invention of glazed or "patent" leather which was used in harness, later in shoes and belts. Also in Newark he engaged in the silver plating of carriage and harness hardware, then made by hand of wrought iron. To avoid the costly hand work in forming the hardware, Boyden undertook to cast the parts in white iron, which could be converted by subsequent lengthy heating, into tough, ductile, malleable iron.

For undertaking his experimental founding and heat treating, Seth Boyden was not without background. At Easton, he had worked at the Easton Furnace, where, on one occasion, the fire bed was torn down for repair. A cast iron bar, long embedded in the hot brick-work, was found to possess considerable toughness and ductility. Although he doubtless did not realize it at the time, the cast bar had probably originally been white iron rather than gray iron, and was therefore susceptible to toughening by prolonged heating.

Reaumur, whose process Boyden wished to duplicate, had malleableized castings by heating them to a bright redness for many days. Due to the composition resulting from European ores, the toughness of the castings came mainly from decarburization rather than from a changing of combined, to free (temper) carbon. Reamur's process therefore was limited to light sections which could be decarburized more easily.

Boyden's American Malleable Iron, however, obtained its properties of toughness and ductility from a heat conversion of the combined carbon of the original white iron into ferrite (carbonless iron) and nodules of free carbon. This accomplishment was

Fig. 2—Malleable casting for knitting machine. Duplicate part is bent to show metal's ductility

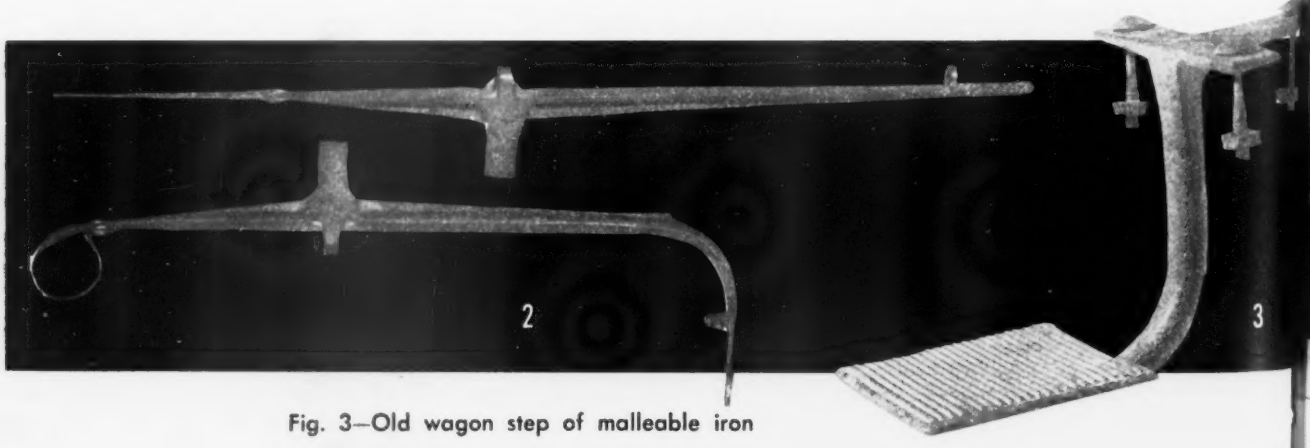


Fig. 3—Old wagon step of malleable iron

This year marks the 125th anniversary of Seth Boyden's first production of what now is known as American malleable iron. The author traces the development of malleable iron castings from their earliest application for harness hardware and wagon parts to their widespread use today

Iron AND NOW

By JAMES H. LANSING
Technical and Research Director
Malleable Founders' Society
Cleveland

due to the fact that the American raw materials were higher in silicon and lower in sulphur, both circumstances favoring the breaking up of the combined carbon at high temperature. American malleable iron, therefore, came into being in 1826 as a cast and subsequently heat treated (annealed) alloy. It consists principally of iron and carbon and, as cast, is extremely hard and brittle, but is rendered tough and ductile by a subsequent heat-conversion process.

As is stated in "American Malleable Iron—A Handbook," "Because of a unique metallurgical structure, it possesses properties which, by reason of their combination in one metal, establish it as an ideal material for a wide diversity of applications. Chiefly, these properties are: Toughness; excellent resistance to heavy and repeated impact; excellent ductility; good resistance to corrosion; easy machinability; and a versatile castability that makes possible sound castings, accurate to pattern, in complicated as well as simple forms, over an extensive range of weights and sizes."[1]

In 1826 and the years immediately following, Seth Boyden produced malleable castings for harness hardware and parts for the wagons and coaches of that day. He is reported to have made over a thousand different articles of malleable iron, the principal items being castings for coach-makers, for harness and saddlery, for gunsmiths, blacksmiths and machinists. Saddlery hardware castings included buckles, bits, snaps and stirrups. Snaps of the type shown here (Fig. 14) with other saddlery items, were then used in harness and for hitching purposes. Today they are used for the same purpose as well as in the many applications where a positive, but easily releasable, fastener is of value. Examples include army truck covers, army truck tail gate chain snaps, boat covers and fasteners, and tie chains of many types.

Vehicle parts of malleable, comprised such items as whiffle tree tips, hooks, clevises and pins, fifth wheels, bolster plates, hubs, hub bands, flanges, skeins, braces, brackets, and steps. An old wagon step, typical of such early malleable use is shown in Fig. 3. Boyden also made "cavasons for the Spanish market." A cavason was a ring with a staple cast on it, which is put on the nose of a horse in order to

Fig. 4—Brake head and fulcrum

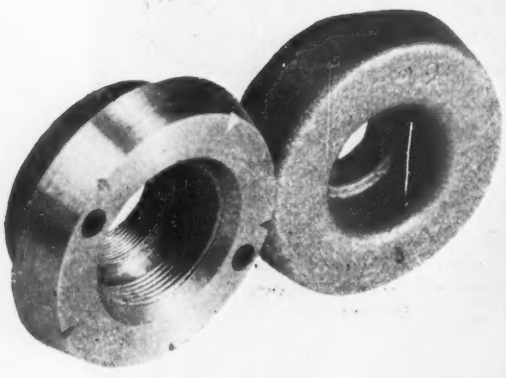


Fig. 5 — Shell adapter made of malleable iron saves metal and machining time needed

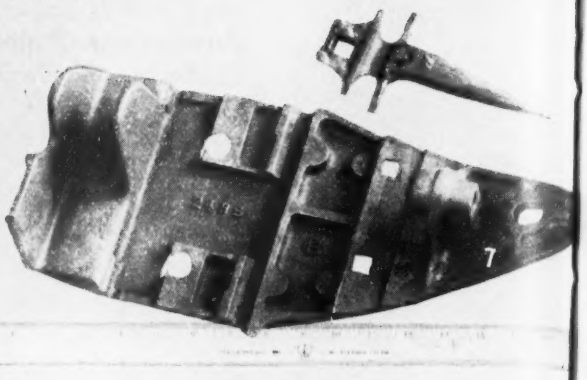


Fig. 7—Mower shoe and knife guard

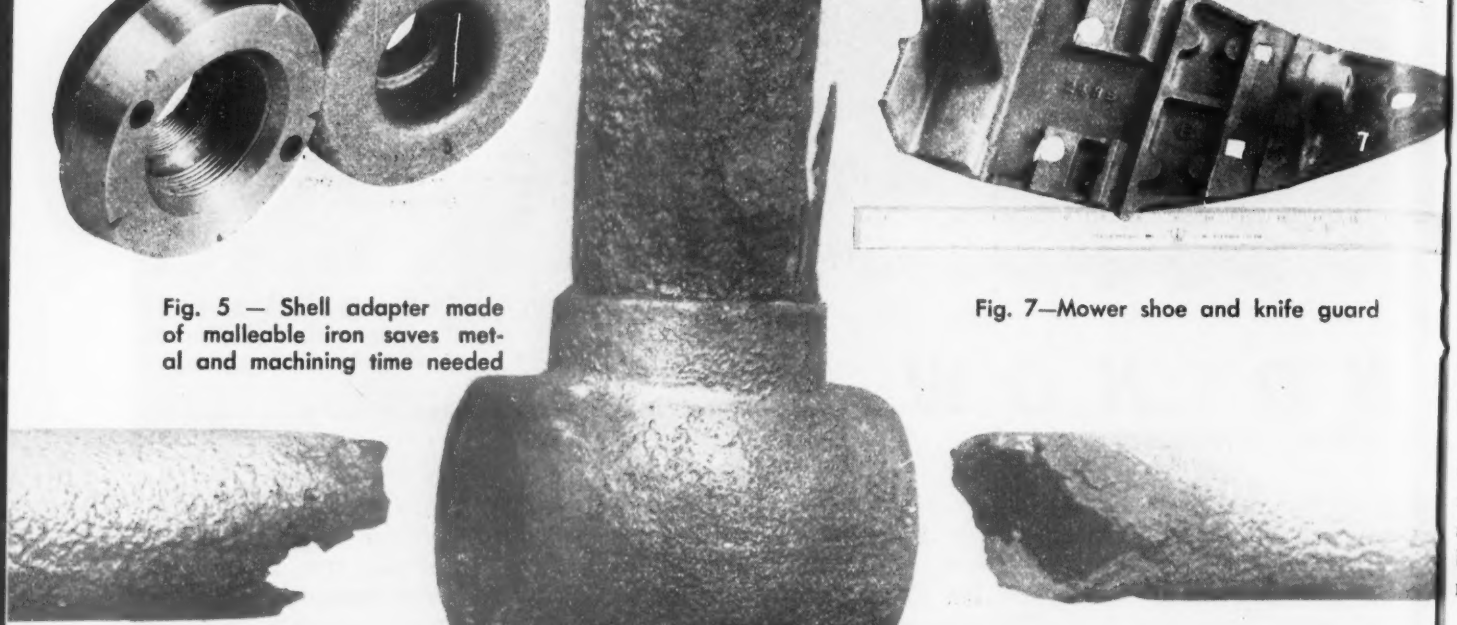


Fig. 6—Railing pipe entirely corroded away at joint, but malleable fitting still good

Fig. 8—Automotive differential carrier, case and bearing caps made of malleable iron

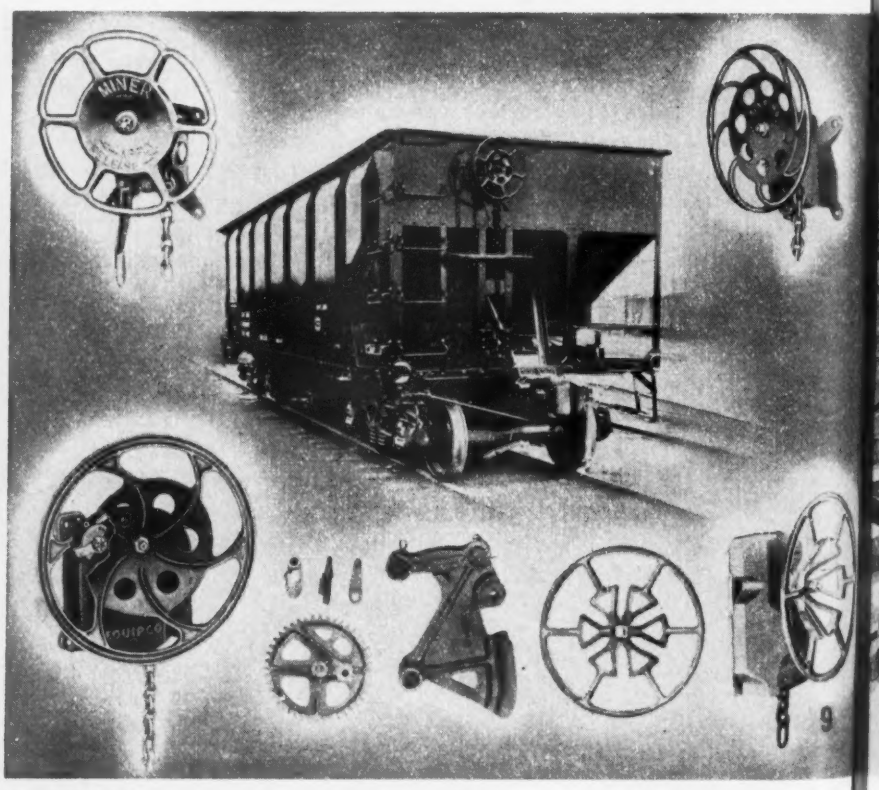


Fig. 9—Malleable brake wheel and brake mechanism parts on a freight car

wrench it so as to facilitate breaking in.[2]

At Easton, Seth Boyden's brother, Alexander, started making malleable iron four years after his older brother's discovery. Here fire tongs and other fire place hardware, hammers, axes and chisels were made. Early malleable foundries in New Jersey, New England and New York cast stove trimmings, fliers for cotton speeders and fly frames, pump castings, mule fingers, loom forks, keys, axle nuts, turns and catches for stoves, tie buckles for cotton bales, shanks for garden trowels and rakes. By 1849 pipe fittings were being made of malleable. Their excellent corrosion resistance is indicated in Fig. 6. Textile machinery manufacturers also used malleables to advantage. (Fig. 2).

Boyden's first iron was melted in a crucible, subsequently air furnace and some cupolas being employed in the industry. For annealing, castings were packed in pots in beehive or crude continuous furnaces.

The use of malleable iron in rakes and hoes led to its application in a large number of parts, when farm equipment manufacture started on an industrial scale. Parts for plows, cultivators, mowers, reapers, binders and spreaders were progressively made of malleable and still are today (Fig. 7).

By the 1890's, the railroads were large users of malleable castings in journal boxes and lids, wedges, draw-bars, brackets, hooks, brake equipment, door fasteners, hangers and guides, stake pockets, turnbuckles, switch castings, rail braces, spring seats, truck columns, and many others. Brakeheads and fulcrums are probably the best known malleable castings in continuous railroad use. Hand brake wheels and geared brake components also take considerable malleable tonnage (Figs. 4 and 9).

ASTM—A 220-50—Pearlitic Malleable Iron

	Grade 43010	Grade 48005	Grade 53004	Grade 60003	Grade 70002
Tensile strength min psi	60,000	70,000	80,000	80,000	90,000
Yield point or yield strength min psi	43,000	48,000	53,000	60,000	70,000
Elongation in 2", min %	10	5	4	3	2
Typical hardness number range	163–207	179–228	197–241	197–241	241–285

By 1901, with railroad and agricultural implement malleables in wide use, the industry had started to serve in what was to become its greatest field of usefulness, automotive transportation. The early cars had drive housings, steering gear supports and hubs of malleable. In another decade they included hubs, differential carriers, differential cases, steering gear housings, spring hangers and top prop rests. As time went on, generator supports, wheel carriers, shock absorber housings, steering post brackets, brake supports, pedal brackets, pedals and other applications were added (Fig. 15). In automotive trucks and trailers large tonnages of malleables are also used.

Influenced by the toughness and dependability of malleable iron, its easy machinability and its adaptability to quantity production, the automotive industry has become the largest user of malleable castings. Half a million tons are used by that industry in a good production year. Fig. 8 shows typical automotive applications. Furthermore, uses of pearlitic malleables are regularly increasing.

Pearlitic malleables especially recommend themselves in applications where greater strength, hardness and resistance to abrasive wear, than that of standard malleable iron, are desired and where somewhat less ductility and shock resistance are permissible. They are basically malleables but contain some carbon in the combined form. Five grades are covered by ASTM Specification A 220-50, as shown in the accompanying table.

Pearlitic malleable is used to advantage where rigidity, strength, and wear resistance are important factors, as in gears, sprockets, wearing pads, rocker

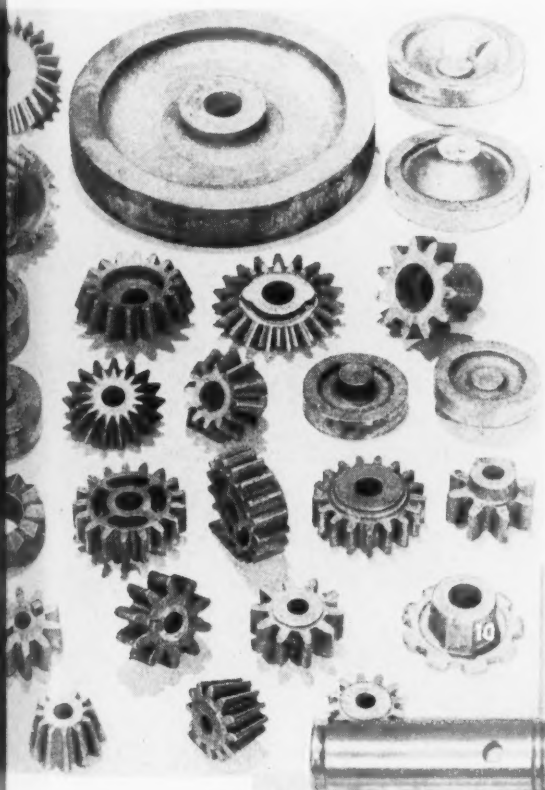
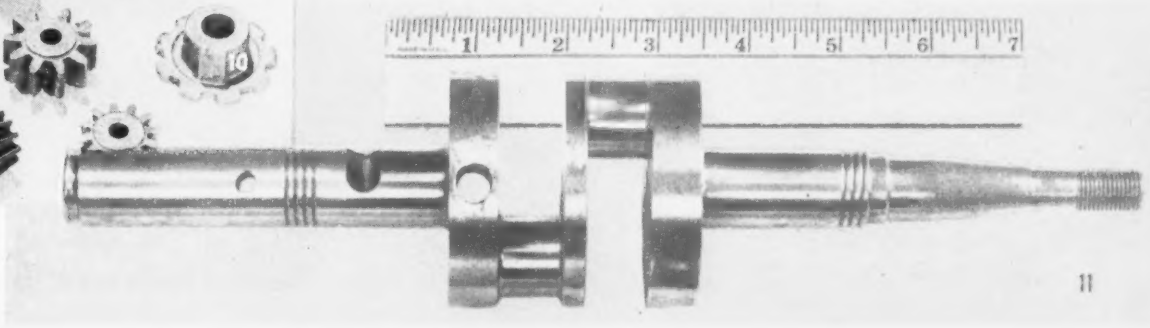


Fig. 10—Pearlitic malleable cast gears and sprockets, gear blocks, clutch plates. Fig. 11—Motor crankshaft



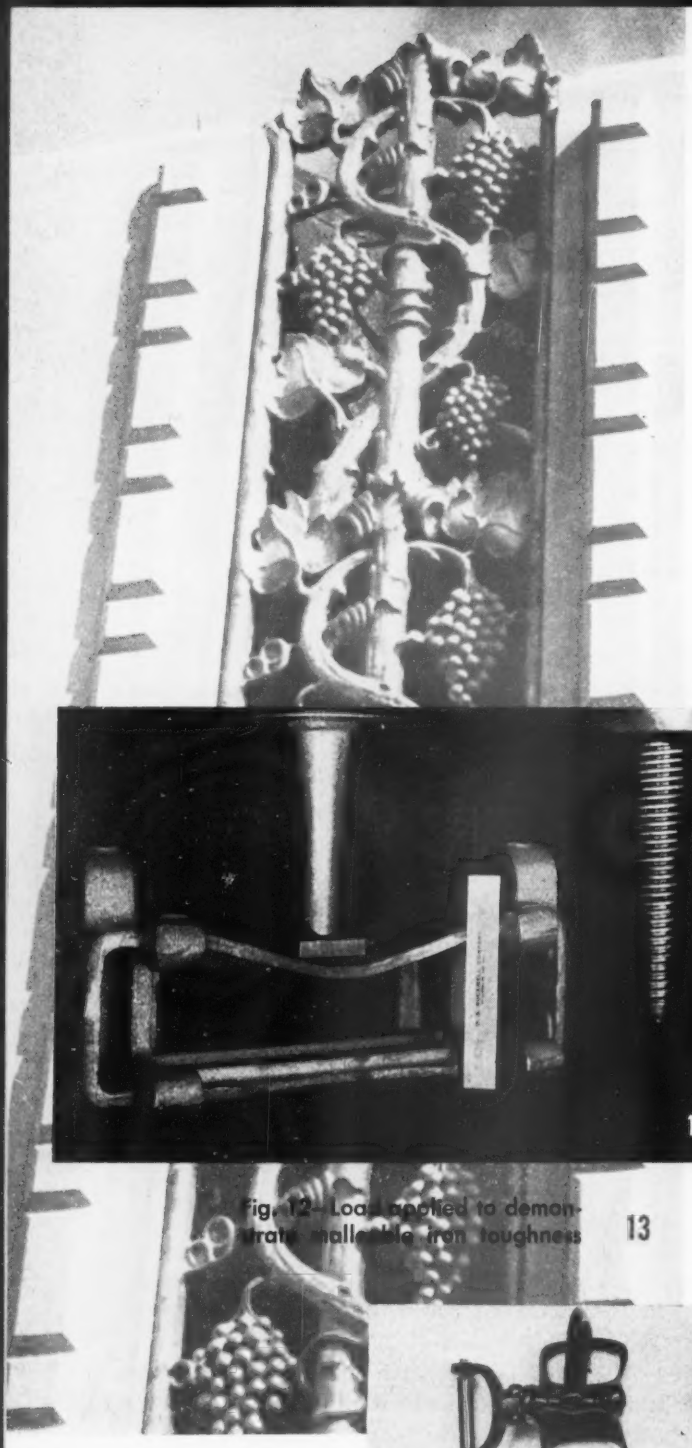


Fig. 13 — Decorative superhighway crossover panel

Fig. 12 — Load applied to demonstrate malleable iron toughness

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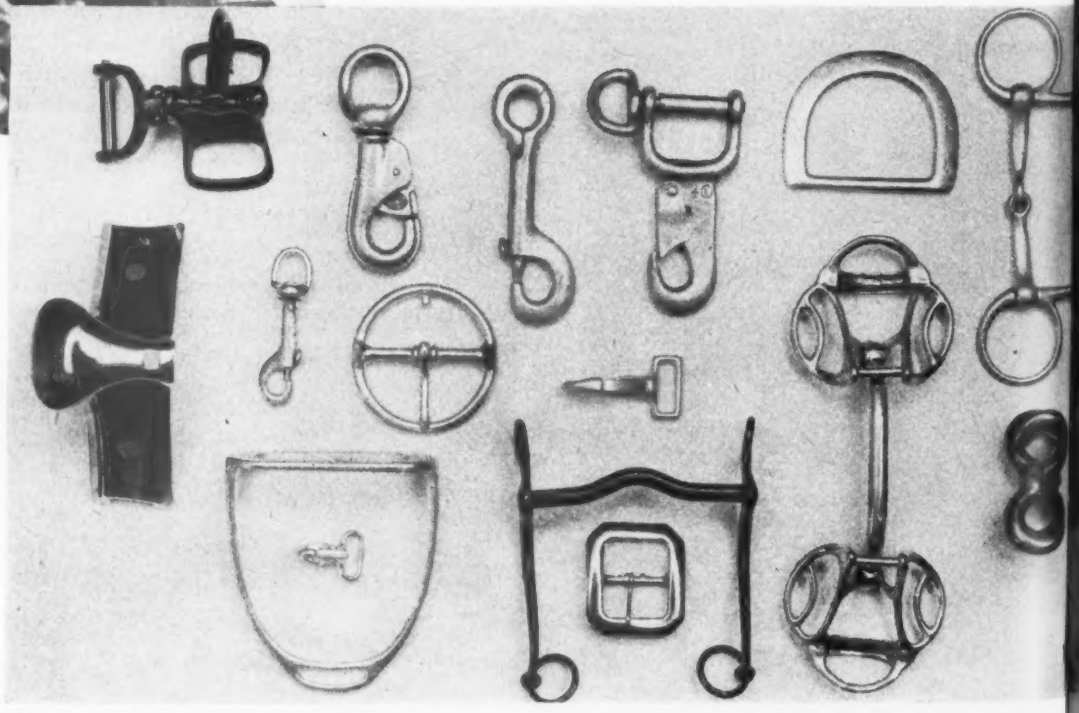


Fig. 14 — Early harness hardwo e of malleable iron

arms, automatic transmission parts and universal joint yokes. It machines less readily and has a higher indentation hardness than standard malleable but when compared with drop forgings and steel bar stock of identical brinell hardness, may be machined in less time, with greater tool life and at less cost than these latter materials. In comparison with forgings and parts machined from stock, pearlitic malleable also possesses the advantages inherent in a cast part.

In World War II standard malleable not only contributed its parts to trucks, tanks and combat vehicles but to bombs and ammunition components as well. Advantage was taken of its toughness, castability and machineability to save critical metal, machine tools and man hours. An example is the 5-inch anti-aircraft shell adapter, originally machined from a piece of steel bar stock weighing 3¾ pounds. With steel scarce, machine tools scarce, manpower and time critical, a malleable casting, cast close to size and weighing but 2¼ was used to effect a saving of 1½ pounds on each of many hundred thousands of parts (Fig. 5). In addition to saving machining time to cut away the useless 1½ pounds of metal, there was a further saving in the fact that malleable machines more easily. It served in machine gun pintles, in Bofors and Oerlikon gun parts, in shell components, lifting plugs, as well as in many other applications in which, on its 125th anniversary, it is again finding use. (Fig. 16 shows machine gun mountings).

In the production of malleable iron, air furnaces, which avoid direct contact of the metal and fuel, are still widely used. Originally fired by hand with natural draft, the first improvement was the addition of a bottom blast and top blast to speed combustion and make it more complete. The development of effective coal pulverizers, however, at about the 100th

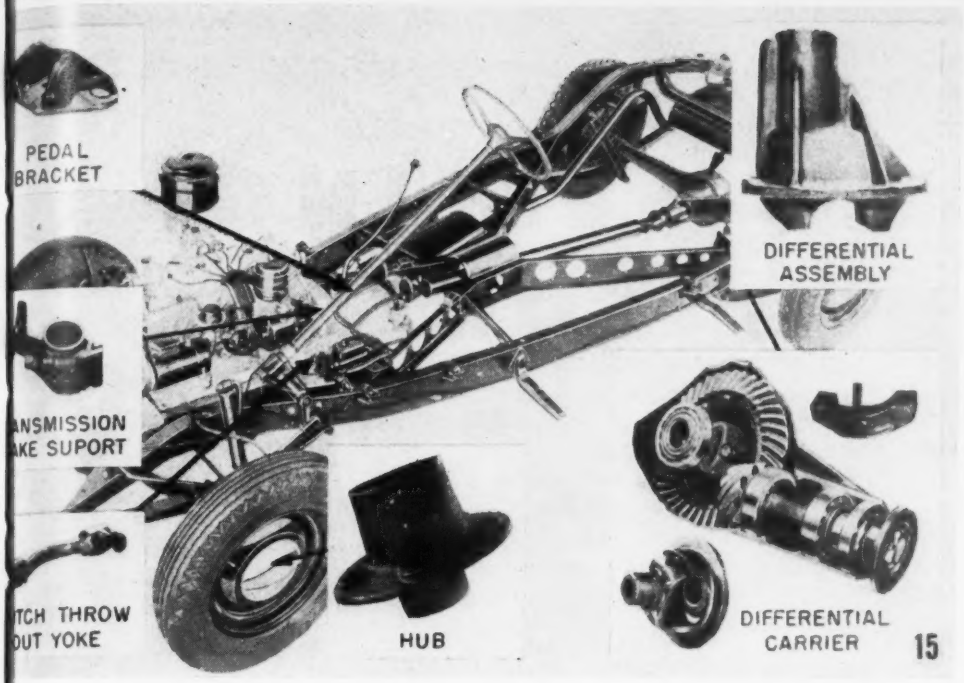


Fig. 15—Automobile chassis and malleable parts

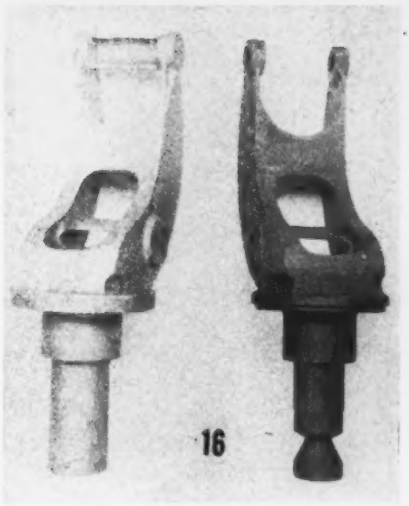


Fig. 16—Machine gun mountings

anniversary of the industry, eliminated the laborious hand-firing. Oil is also satisfactorily used for air furnace melting. To provide a continuous flow of metal for conveyorized malleable foundries, duplex melting units, in which the metal is originally melted in a cupola and then refined in an air furnace or electric furnace, are effectively employed.

Most of the periodic coal-fired ovens in which the castings are protected by pots or large iron boxes during the anneal, were originally fired by hand. Pulverized coal or oil, as in the case of the air furnace, has replaced this method of firing. A number of continuous ovens, in which the castings travel through the annealing cycle in pots stacked on cars, are in use. Electrically heated ovens are effectively used for annealing, no protecting pots being required and a shorter cycle being employed. The same applies to gas-fired radiant tube ovens in which the castings are protected by a prepared, essentially neutral, atmosphere to protect the castings against oxidation. These ovens are of either the periodic or continuous type.

Malleable applications may be ornamental as well as useful. Fig. 13 shows a decorative panel on a superhighway crossover.

Today malleable iron castings are made by a hundred companies operating foundries in 21 states. These plants can produce over 1¼ million tons of malleable iron castings per year. The industry employs some 40,000 people (*Please turn to page* 267)

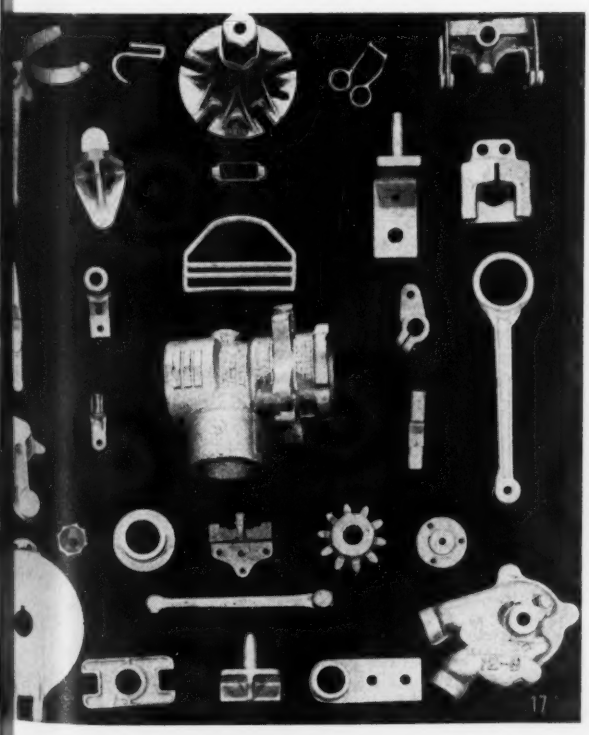


Fig. 17—Typical modern malleable iron castings

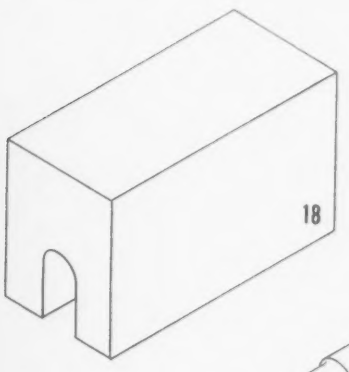


Fig. 18 — Keel block from which bars are machined for some materials

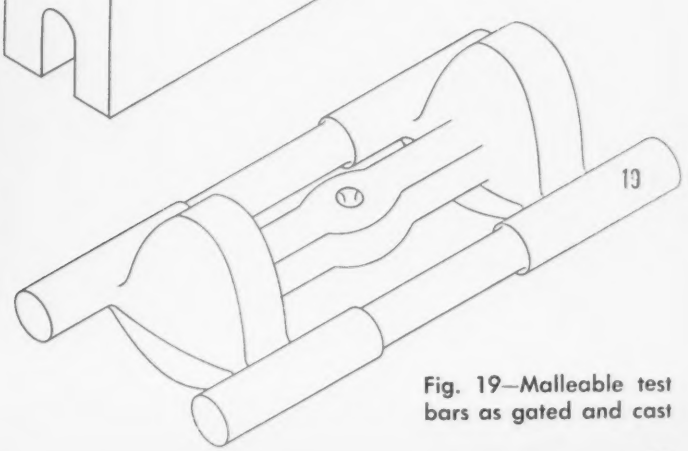
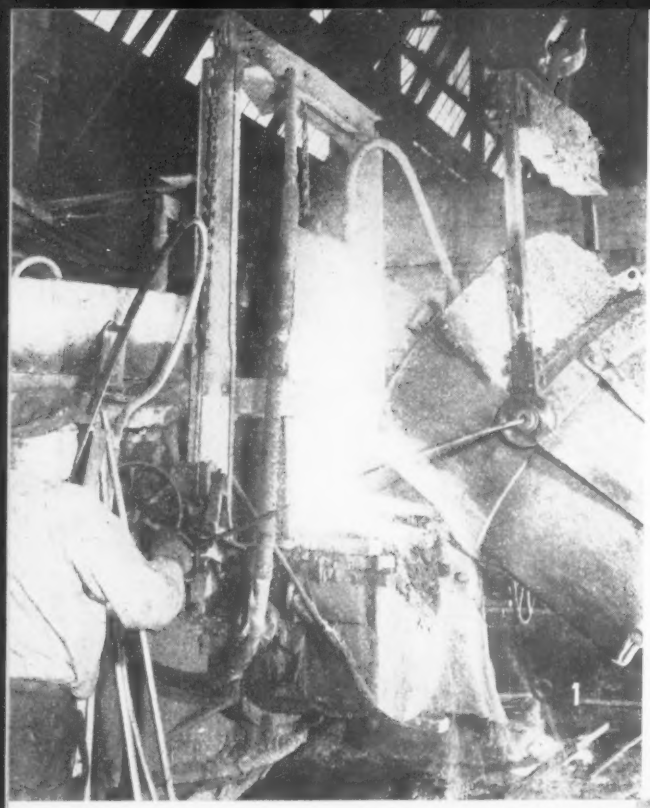


Fig. 19—Malleable test bars as gated and cast



MELTING CONTROL Pays

IN MALLEABLE

By EDWIN BREMER
Metallurgical Editor
FOUNDRY

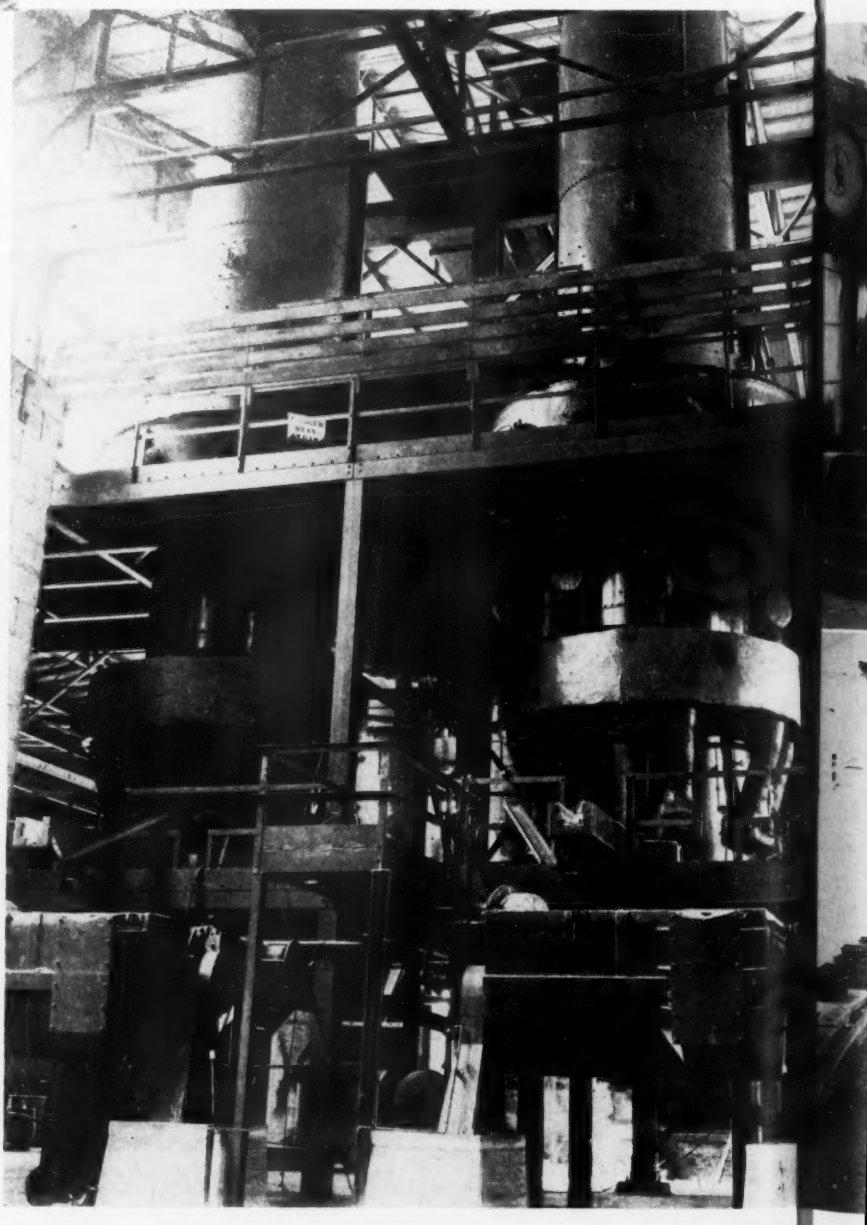


Fig. 1—At regular intervals hot metal from the cupola forehearth is charged into the electric furnace

Fig. 2—Cupolas and forehearths are located high above the ground level to accommodate the transport ladle

Fig. 3—Electrically driven transport car carries buckets under bins for loading

Fig. 4—On one molding line the molds are set out on platforms suspended from an overhead conveyor chain

Fig. 5 — View along another molding line using car-type conveyor shown just to the left

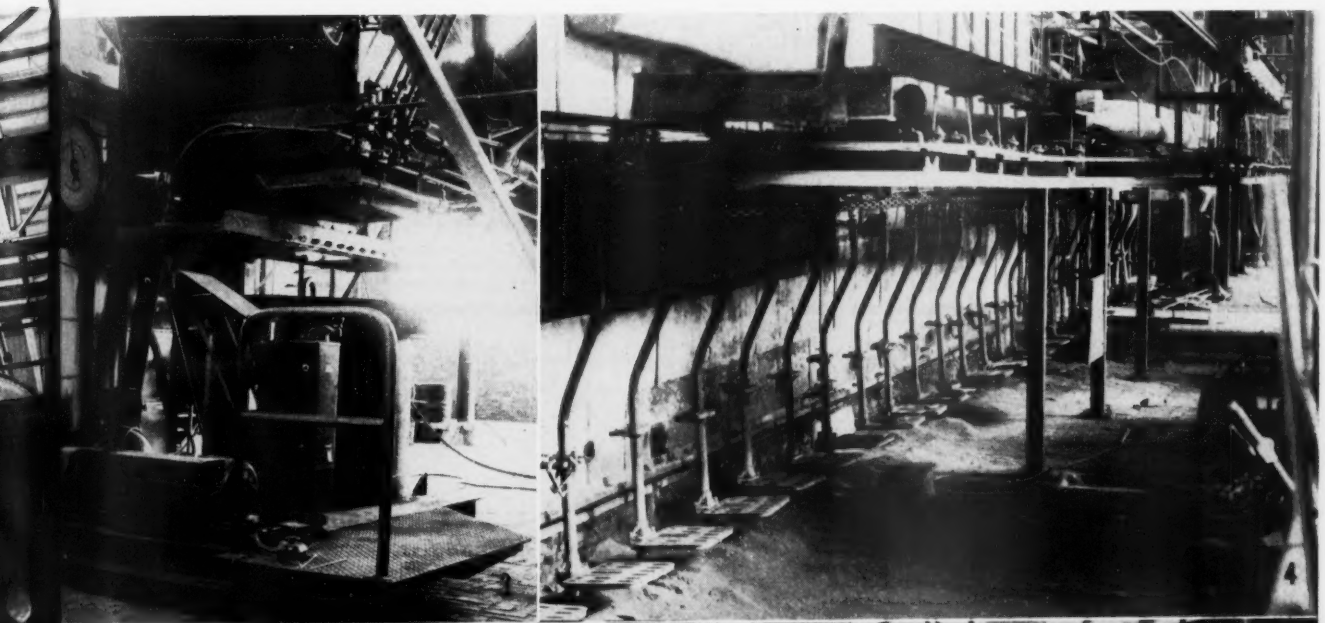
...Off

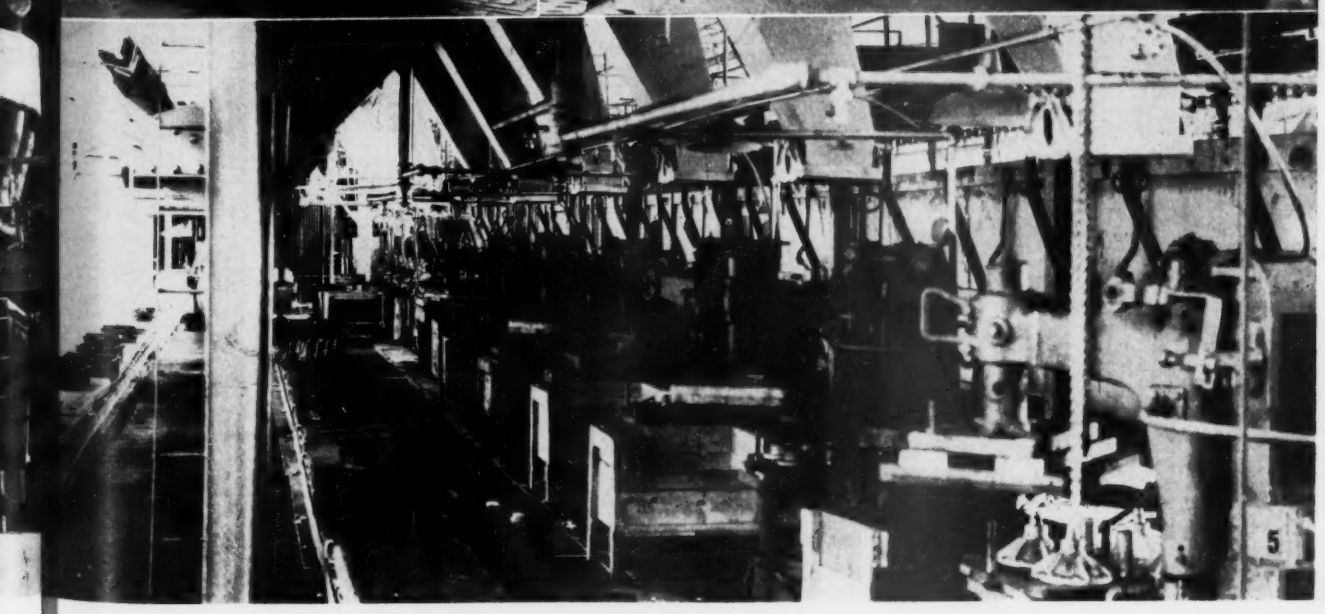
BOUNDRY

FOR a number of years prior to 1945 the Edgewater plant of Auto Specialties Mfg. Co., St. Joseph, Mich., produced malleable iron by melting in electric furnaces, using a combination of cold batch and duplexing. In that procedure electric furnaces of 40, 9 and two of 8 tons capacity were charged with cold metal, and the power turned on about an hour apart on each of the furnaces. When all the metal from the first small furnace was poured off, that furnace was filled from the large furnace, and the same was done with the other two in turn. Then sufficient cold material (about 10 tons) was placed in the large furnace to bring the bath to 25 tons to supply one more round to the three small furnaces.

While that method served satisfactorily for a considerable period, the gradually increasing demands for greater tonnage following the war years led to the considerations of the most suitable procedure to meet existing as well as some future requirements. After careful survey and study of all the factors involved, decision was made to supplant the all-electric duplexing with the cupola-electric furnace process. In addition, it was decided to incorporate some refinements which would permit closer control of melting as well as of the resulting iron. This included installation of a hot-blast unit and equipment to dry the air supply to the cupolas.

Inclusion of those facilities has proved advantageous both metallurgically and economically. It has permitted analysis of the iron to be held to closer tol-





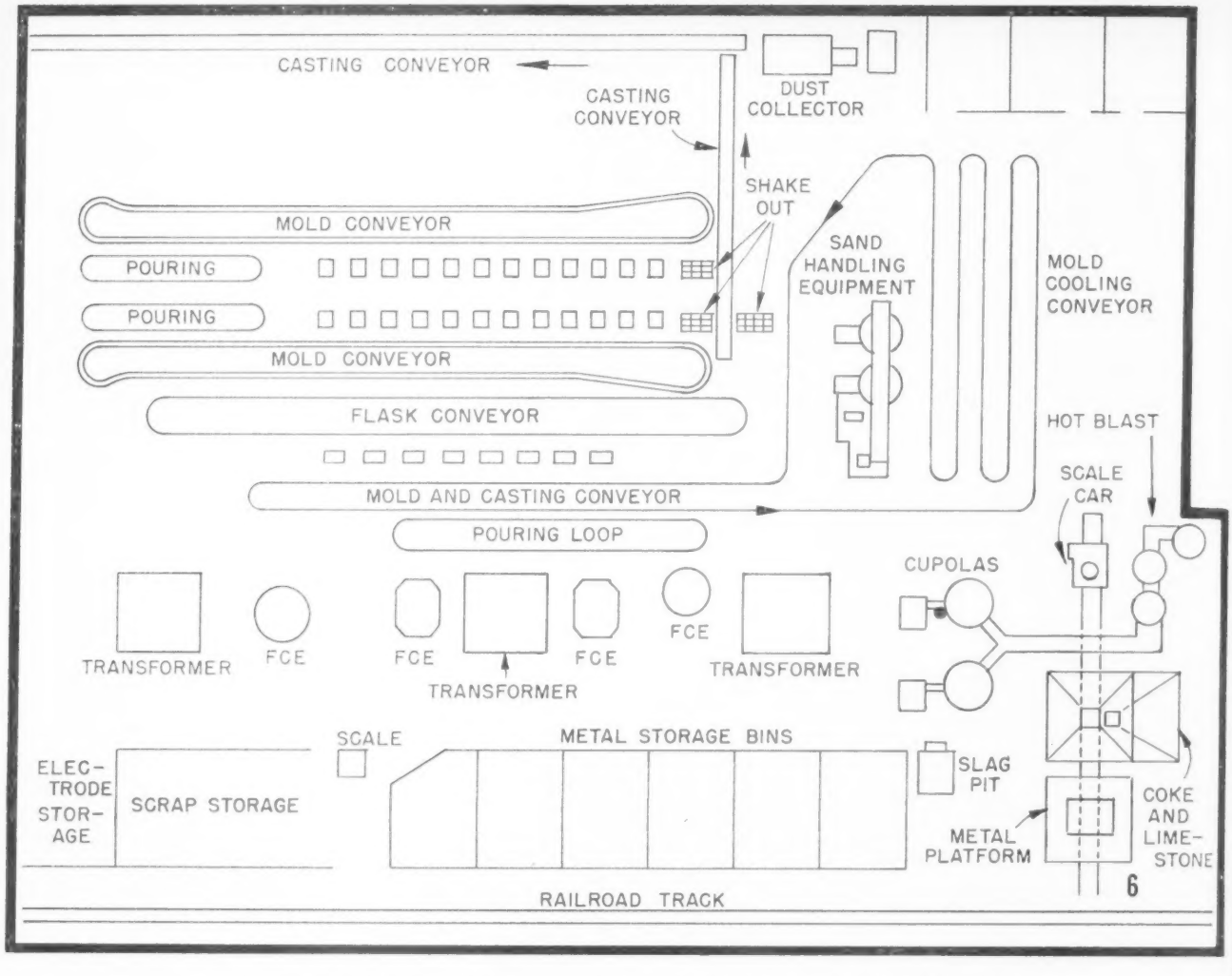


Fig. 6—Sketch of the foundry showing the general arrangement of molding lines, cupolas, electric furnaces, metal storage bins, sand handling equipment, etc.

Fig. 7—Molds are poured by operators standing on platforms traveling at same rate as mold conveyors

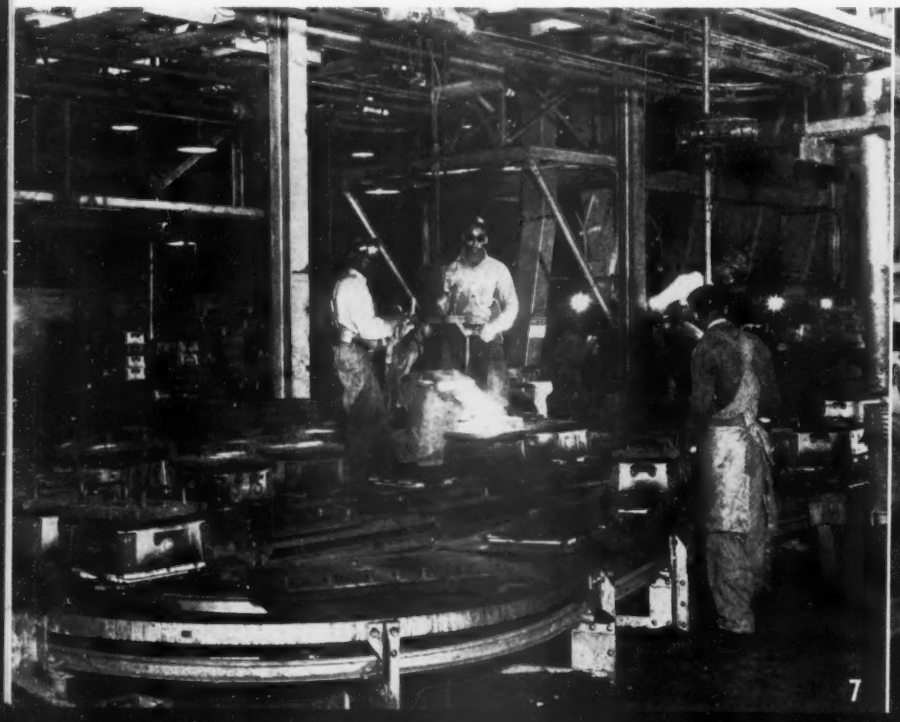
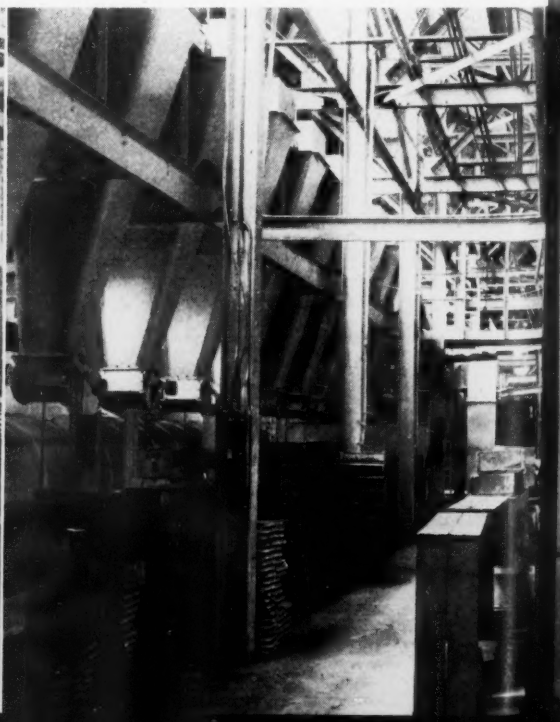


Fig. 8—View between two molding lines showing good housekeeping. Exhaust tunnel for poured molds at left



erances, melting losses are held to a minimum and the iron anneals more readily. Coke consumption is less than when cold blast is employed; at present the coke-to-iron ratio is 1:10, and ratios of 1:12 to 1:13 have been used.

Iron is melted in two cupolas which are used alternately. Cupolas, together with the accompanying hot-blast and blast dehumidifying apparatus, are located in one corner of a building about 260 ft long and 208 ft wide. Hot-blast equipment is the Griffin type which utilizes incompletely burned gases from the cupolas to preheat the air supply. The gases are withdrawn from the cupolas slightly below the charging door into a combustion chamber where they are ignited. Burning gases then pass through two counter-current heat exchangers where they preheat the incoming air blast. Air is heated to 300 to 350°F and can be controlled within plus or minus 5° by adjusting the volume of hot gases going into the combustion chamber and admitting cold outside air into the heat exchangers. Two auxiliary oil burners form a part of the hot blast installation and serve two functions. One is preheating the blast to the control point before beginning the heat, and the other is as an emergency source of heat in case there is not enough CO in the stack gases to support combustion—for example, with coke-to-iron ratios of 1:12 or 1:13.

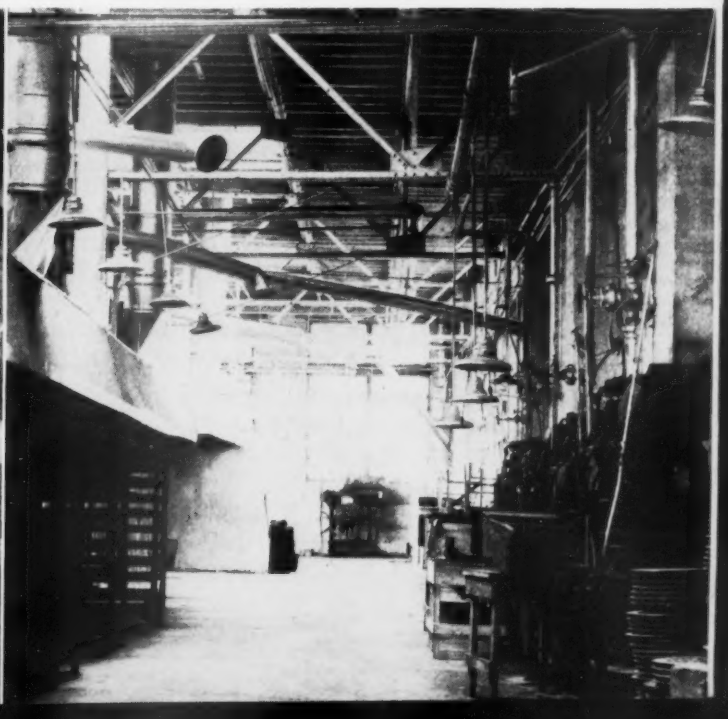
Humidity control of the air blast is accomplished with the Kathabar system using lithium chloride solution as the moisture controlling agent. That solution absorbs moisture from air when its temperature is low and its specific gravity high, and gives up moisture when its temperature is high. In general the specific gravity of the solution is held constant, and the absorption or emission of moisture is controlled by adjustment of the temperature. Actual control is accomplished by wet and dry bulb thermometry. Incoming air is maintained at a constant temperature through a dry bulb proportioning control actuating heating coil. Temperature of the wet bulb depends on the rate of evaporation of moisture from the wick covering the bulb; being lower with rapid evaporation, and higher with slow evaporation. Rapid evaporation results when the air stream is low in moisture content and slow evaporation occurs when moisture in air is high. Wet bulb thermometer is connected to mechanism which heats or cools the lithium chloride solution to maintain the moisture content of the air blast at 55 grains per lb or 4¼ grains per cu ft.

Cupolas are lined to 66 in. and, as shown in Fig. 2, the bottoms are located about 11 ft above the floor level to accommodate 10-ton capacity, tilting type, covered forehearths as well as to permit transfer of metal from the forehearths into 5-ton capacity transfer ladles. One of the important reasons the cupolas were raised to 11 ft was to allow a drop car to pass under the cupola and receive the drop at the end of the 16-hour operation. This is done by moving a large tapered side car to the operating cupola. The air valve is used to release the cam lugs that hold the bottom of the cupola in place. This allows a complete drop to enter the car and the car immediately moves out into the quenching system, leaving the floor under and around the cupola perfectly clean. By this method one of the very messy operations connected with cupolas—cleaning up a quenched drop on the floor—is completely eliminated. The operation takes only about 5 minutes of one man's time and makes the cupola quickly available for any interior work necessary.

Metal charges in the cupolas consist approximately of 11 to 12 per cent silvery pig iron containing 9 to 10 per cent Si, 10 per cent structural steel scrap, 10 per cent steel bundles, 18 to 19 per cent steel plate scrap and the remainder sprues. Charges weigh 6000 lb and, as previously men- (*Please turn to page* 264)

Fig. 9—Shakeout grid at left is hooded for dust removal. Castings slide onto apron conveyor which elevates them up and across the foundry

Fig. 10—Cores are produced both by hand and with blowers shown at the right. Hoods in front of ovens at left carry away fumes from baked cores



It's important to the casting buyer that the right kind of pattern be used for his work, but it's equally vital to the foundry. The author cites various examples of the choices available in pattern equipment and offers recommendations for its selection and design

The Pattern Engineer

AND THE FOUNDRY

By G. A. PEALER
General Electric Co.
Elmira, N. Y.

THE GRAY iron foundry industry is one of the essential factors of our national manufacturing economy, and the industry wants to keep it that way. To do this, we in industry must take stock. Let's ask ourselves: Are we standing still? Becoming less agressive? Inclined to follow the time-honored practice of our predecessors? Do we give customer service? How are we gearing our business to the fast tempo of today?

First, we cannot stand still. We either go forward or backward. We are faced with many new products as well as new ways of using the older products and must, if we go forward, be awake to the desirability of not only meeting competition but also of using it to our greatest advantage.

I well remember the days when metal building columns and beams were of cast iron. We have found that structural steel, while taking this class of casting away, has increased business to such an extent that we have a greater tonnage of other castings.

Some may feel the welding industry has hurt us. This should not be so. The judicial use of welding to salvage castings, having minor defects, is enabling many foundries to show a profit. There are also certain castings that would be better in a weldment than as a casting, and there are some weldments that should be cast.

This, then, brings us to the problem—who is to decide what method is better to use? Many of our larger foundries have met this problem by employing a pattern or foundry engineer to review potential work and recommend methods. It may be that in the interest of economy or usage he will recommend certain jobs be made by stamping or welding, or combination of casting, stamping and welding. It should be his duty to recommend to his customer the proper methods of manufacture.

As an illustration, our company makes a special motor. It was made by steel fabrication. The motor is the explosion-proof type and has an inner and outer shell. In fabrication these shells were tied together with 16 steel blocks at the outside end of the shells, and for heat dissipation 1400 ½-in. steel studs are welded to the outside of the inner shell. These could not be welded to the outer shell because of lack of working space between shells. This resulted in some loss in efficiency.

Each frame cost approximately $1300 to fabricate. The foundry made a study of the part, and by a few simple design changes, produced the part in cast iron for $680, a saving of $620 each. The pattern cost $3400, so we paid for the pattern with the first six castings. The order was for eight motors, but because of lower cost and better performances of the casting, our company could lower the selling price of the motor. As a result, we were able to sell 20 motors in six months instead of the estimated 10 or 12 per year.

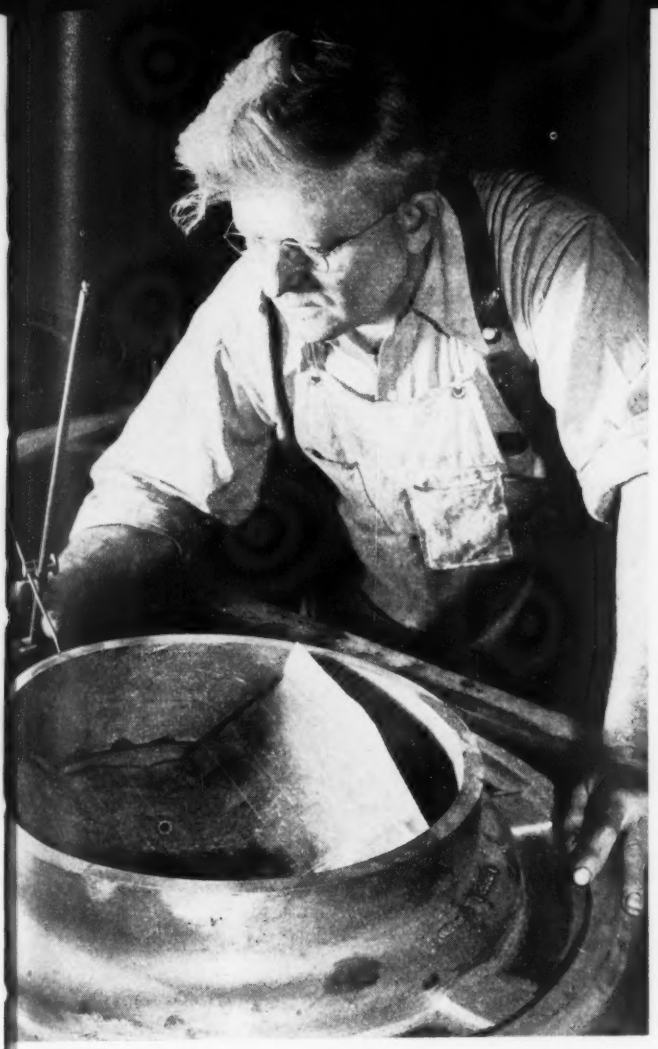
Co-ordination between groups in a large organization is frequently lacking. How many patterns are produced that are perpetual headaches to the foundryman? But don't blame the patternmaker. In many cases he is given a sketch and told, "Make me a cheap pattern for this. I only want a few castings." So he does just that. Then the foundry proceeds to make hundreds of castings from that pattern and, incidentally, damns the pattern and the man who made it. But we never blame the purchasing department who ordered it.

A cheap pattern is just that as far as first costs go, but the upkeep and high cost of the pattern in use are not cheap.

Perhaps we should not blame the purchasing department, but go back to the engineer's lack of good foundry practice. He is interested in making a machine and is not always sure how many will be made, however, co-operative planning between the designer and foundry should go into each new job. The following should be considered:

1. What will be the production? If it is a trial job and cheap patterns are wanted, get two alternate quotations, one based on the cheap patterns and one based on good production patterns.
2. How will production be divided, that is, what production per day or week?
3. What degree of accuracy must be held?
4. What class of metal is called for?

If you do not produce the grade of metal wanted—and the purchaser still insists on his request—don't



go any further but refer him to a foundry fitted for his class of work.

If your shop is suited to the job, then the casting should be studied as follows:

1. For possible changes leading to better molding. (It is sometimes surprising to find a large solid lump of metal running abruptly into a very thin section. In most cases, the design can be changed to equalize the sections or at least replace a square corner with a good looking radius.)

2. Try to show the customer that a few extra dollars spent on pattern equipment will result in a superior looking casting at a much lower cost. If you quote on a job which provides a single loose pattern, first quote as requested, giving pattern and casting cost, and state how many castings can be made from this pattern. Second, quote good wood production equipment describing the pattern and core equipment in detail, giving pattern and casting cost and daily production. If the nature of the job is such that metal equipment should be made, include similar information on that type of equipment.

Patternmakers not connected with a foundry will find this difficult, but for their own and the foundry's good, it should be done. A few days' delay spent in contacting the customer in order to help him and his source of supply for castings will pay large dividends in future work for both. If the foundry is busy, the pattern shop will be busy.

We recently received a request to quote on a job which read: "Please quote cheap wood combination pattern and 12 castings, each A-B-C." We did just that. *But* we also quoted one matchboard pattern equipment for A, one for B, and one for C. The cost of the single patterns was 2¼ times the cost of the combination pattern. But the cost of castings with single patterns was very much reduced.

When this quotation was received, the order clerk called, inquiring why the lower cost castings could not be made from the cheaper pattern. I went into reasons why and after a few minutes another voice broke in —it was a three-way hook-up and the chief engineer was listening in. He said, "Good, make the three matchboard patterns and bill us the lower cost." He was very profuse in his thanks to us setting them straight. It developed this job was going to be a standard part and we will cast at least 200 parts per year from each pattern. The extra pattern cost will be amortized in less than a year, giving our customer a saving thereafter. It also gave the foundry a set of patterns that could be used on the line with no time-consuming and costly changes each time a different set-up was required.

Change Motor End Shield Design

My work takes me into many of our company's shops and I always look over new work being drawn up. A few months back I was shown a set of preliminary drawings for a new line of motor end shields. The draftsman and engineer had co-operated 100 per cent. They were determined to make good metal pattern equipment so the definition of the castings would remain good for years, and also so they would get the lowest priced castings. But the engineer, being pattern cost-conscious, decided he would have two master metal patterns with various change pieces to add to or take away in order to make six separate cast parts. We had a very interesting session and redrew the job into six separate jobs. It proved that we could make the new patterns for all six parts almost as cheaply as we could make the patterns in combination, and at the same time we could redesign the parts, removing various rings and seats needed to insert the combinations. Also, the resulting motor is very much better looking than would have been the case were the patterns made in combination.

This service is essential and should be rendered to the purchaser of castings by the producing foundry. Cost of the service is more than made up by getting better pattern equipment and in many cases being able to reduce the cost of the part to such a degree that more parts will be sold, giving larger production.

I want to emphasize that a good engineer will thank the foundryman for saving him money or making a better, less costly casting possible.

The cost of the pattern, in most cases and certainly in production work, is a small item in the overall cost picture. Therefore, if at all possible, pattern equipment which will mold readily and be suited to the foundry equipment on hand, must be designed.

As an illustration, a buyer sends a drawing to several shops asking for quo- (*Please turn to page* 258)

By GEORGE DI SYLVESTRO
Burnside Steel Foundry Co.
Chicago

STUDY OF Metal Flow IN SAND MOLDS

Studies to determine how metal should flow into the mold can assist in eliminating trial and error methods of designing gating systems. The author employs transparent molds in his metal flow observation

ADVANCEMENT in the art of making castings largely is determined by the skill of the individual whose job it is to do the planning before the job is placed in production. That some planners are more skilled than others is shown by the shifting of certain patterns from one foundry to another until satisfactory castings are finally made from them. In the latter case the castings were produced successfully by following a systematic procedure involving numerous changes and adjustments in gating, risering, padding, bracketing, etc., until the correct solution was found. Naturally such trial and error methods are costly, since experimenting is and always will be expensive.

It is believed there is no other type of business where the trial and error procedure is so rigidly followed as in the foundry industry. When a new job is placed in production all the "bugs" supposedly have been eliminated, but the production department anxiously awaits the first day's run. If procedures have been successful they are established as standards, and it almost is impossible to change them even though certain factors increase production costs greatly.

How can this situation be improved? Many answers can be given to the question, but undoubtedly advance knowledge on (1) how the metal should flow into the mold and fill the cavity, (2) the greatest shrinkage locations and (3) the proper elimination of gases is most important in overcoming trial and error methods.

In recent years most steel foundries under pressure of greater production have changed their pouring systems from "over the lip" or shank pouring to "bottom pouring." When that change was made, no thought was given to any change in certain molding practices, since this was believed unnecessary. It is the author's conviction that this neglect is a source of scrapped castings; this opinion is based on the fact that molten metal flowing into the mold from a bottom-pour ladle enters at a greater velocity than when poured over the lip. The increased velocity causes greater violence and turbulence in the gating system which, however, can be counteracted by suitable changes.

Careful study of molten steel poured into molds from four different ladles disclosed interesting facts. Ladles used included an over-the-lip ladle, and 1300-lb, 1850-lb and 17,000-lb bottom-pour ladles. The study was to determine an average approximate rate of speed of the metal entering molds. The over-the-lip ladle was used to pour small castings; each mold contained 54 lb of steel, and the pouring sprue was 1¼ in. in diam. Each mold required 0.06-minute for pouring with the human element involved, or an approximate rate of 900 lb of steel per minute.

The 1300-lb bottom-pour ladle was used to pour a 250-lb casting. Ladle nozzle was 1¼ in. in diam and the down sprue of the mold 1½ in. in diam. First mold was poured in 0.05-minute; the second in 0.07-minute; the third in 0.12-minute; the fourth in 0.15-minute and the fifth in 0.21-minute, or average of 2083 lb per minute. In this case the greatest velocity was obtained with the first mold, indicating that one out of five molds is subject to a flow equivalent to 5000 lb per minute. Also the data show that pouring speed of a small bottom-pour ladle is almost six times that of an over-the-lip ladle.

It is obvious that the greater velocity with which the metal enters the mold from the bottom pour ladle must be controlled. It must be accomplished by changing the gating system to prevent erosion, turbulence, shifting and raising of cores, and "wash outs."

When the 1850-lb bottom pour ladle was used with a 1½-in. nozzle pouring a casting weighing 450 lb, the results were: First mold was poured in 0.11-minute;

Fig. 1—Gate core runner boxes used to make possible the fast pouring of light steel castings

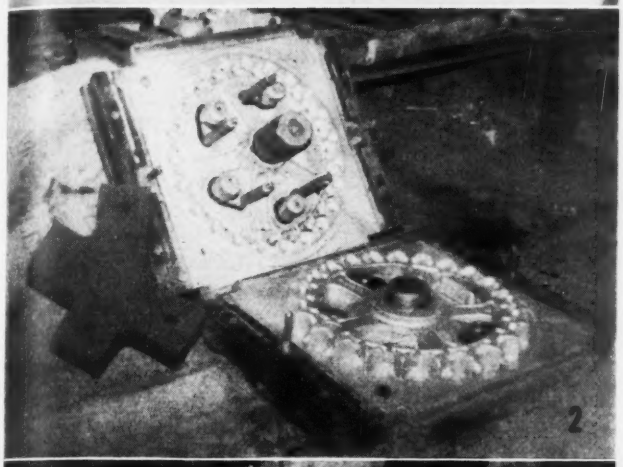


Fig. 2—Typical casting poured with runner box designed to provide multiple streams of metal

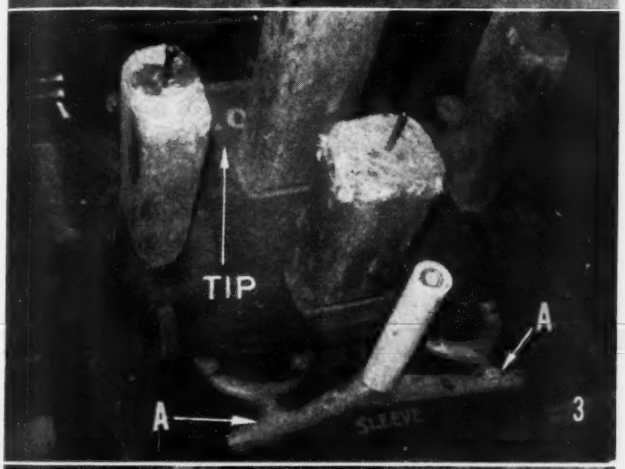


Fig. 3—Gas formation in areas indicated at A was caused by excessively rapid flow of metal

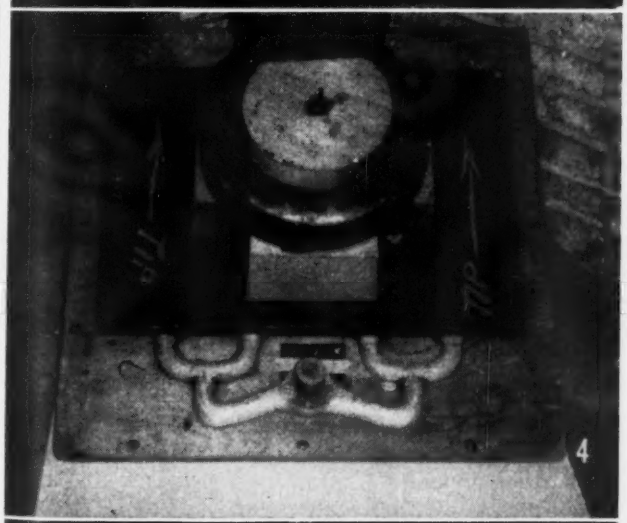


Fig. 4—Gating system streamlined to eliminate the "blind" ends prevailing in Fig. 3

Fig. 5—Example of gating which restricts metal flow by division and change of direction

the second in 0.15-minute; the third in 0.23-minute and the fourth in 0.31-minute, or an average of 2250 lb per minute. Speed of pouring of the first mold was equivalent to 4000 lb per minute. Pouring of metal in this case was done by the fluctuating method. That is, introducing the metal slowly, then gradually opening the nozzle to increase the flow. This method of pouring creates a cushion of metal at the beginning to receive the later incoming metal, and thus prevents a certain amount of the violent spatter which occurs in the mold as the first metal strikes the restricting walls.

It is believed that the fluctuating method of pouring should not be used with small bottom-pour ladles, since such pouring produces "leakers" and "freeze-ups" of the nozzles. However, breaking the flow in the gates can overcome these ladle difficulties and make possible fast pouring of light castings. Fig. 1 shows five gate core runner boxes which are used exclusively to: Break the drop of the metal above the mold; break up the flow, decreasing the velocity and erosion, and distribute hot metal to vital parts of the mold. Some of the core runner boxes are designed to produce two to five separate streams of metal from one pouring cup to produce castings such as shown in Fig. 2.

Observations of the 17,000-lb bottom pour ladle were made on two different castings. One of these was a housing weighing 1325 lb. First mold was poured in 0.64-minute; the second in 0.72-minute; the third in 0.73-minute; the fourth in 0.75-minute, and the fifth in 0.92-minute, or an average of 1762 lb per minute. The other casting poured from the ladle was a spindle weighing 600 lb. Pouring time for the first mold was 0.29-minute; the second 0.32-minute; the third 0.32-minute; the fourth 0.35-minute and the fifth 0.45-minute, or an average of 2363 lb per minute. These molds were poured using the fluctuating method with a 2-in. nozzle. The pourer was trained, having considerable experience as evidenced by the close pouring times of the several molds.

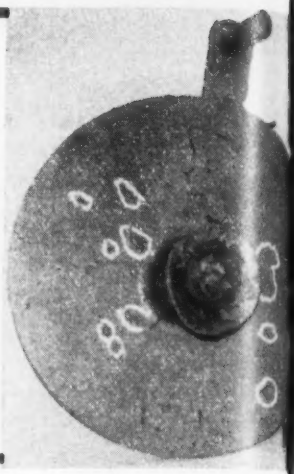
The controlled flow gates also were a determining factor in producing the good results. Greatest velocity

obtained was slightly more than 2100 lb per minute, and the reader will observe that with all the bottom-pour ladles the time for pouring the first mold is less than that for the fifth mold. This is due to the greater head pressure in the ladle at the beginning. It is apparent that small and medium bottom pour ladles are the source of many defective castings due to the violent flow of metal. If the violent flow is not controlled it may promote gas formations in areas which are "compressive constrictions," such as indicated at *A* in Fig. 3. Air drawn down into the gate is forced into the metal at such restrictions. These and the accumulation of dross in the metal stream may be the source of "snotters" called fayalite. Much oxidation occurs in abrupt gates and the increased turbulence there promotes fayalite.

Fig. 4 shows a similar gating system which has been streamlined to eliminate the "blind" ends of Fig. 3. It is believed the dirty condition found in "dead spots" of certain castings is due to vortexes in the metal flow. That condition has been overcome by tipping the mold as shown in Figs. 3 and 4, with the gates at the low point and the risers at the high point. Tipping not only gradates the metal flow but also aids gas escape. Risers at the highest point of the mold feed the casting more effectively.

Fig. 5 is an example of gating which restricts the flow by division and change of direction. The metal is divided into two equal streams from the sprue at *A*, and again at *B*. A slab core is rammed up at the base of the sprue to prevent any cutting action at that point. This method of gating reduces velocity and static pressure due to change in direction of metal flow. It is obvious that metal so distributed will maintain an even temperature until the mold is filled. This procedure insures against erosion which would be produced by greater turbulence when the metal enters the mold by direct gates such as shown in Fig. 6. Many sources outside this study indicate that such a gating system should not be practiced, since the metal enters the two inlets farthest from the sprue first and tends to dribble into the others.

Figs. 10-14 — Experimental castings made in study of metal flow. Inclusions are encircled with chalk



An example of a gating system which introduces another advantage is shown in Fig. 7. This system is similar to that in Fig. 5 except that it changes the direction of the metal flow as it enters the fluid risers. Metal entering in bottom gates under the risers has its flow restricted and turbulence localized. This casting was subject to a pressure test and the gating arrangement produced far less rejects.

The whirl gate shown in Fig. 8 is used extensively by many foundries, but to be effective must be applied properly. In Fig. 8 the gate functions as indicated by the arrows, and involves a change in direction which defeats the purpose of the whirl, and results in erosion at point *X*. Fig. 9 shows a change in position of the whirl gate which results in continuing the action in the casting and keeping the metal "alive."

To make studies of metal action entering and while in the mold, the author developed a method of using transparent materials for constructing the mold of any scale or size to simulate the problem casting. Material may be plastic, glass or any transparent material which may be molded, cast, fabricated or assembled. Mold is gated, risered, vented and poured with equal velocity, with any liquid metal, compound

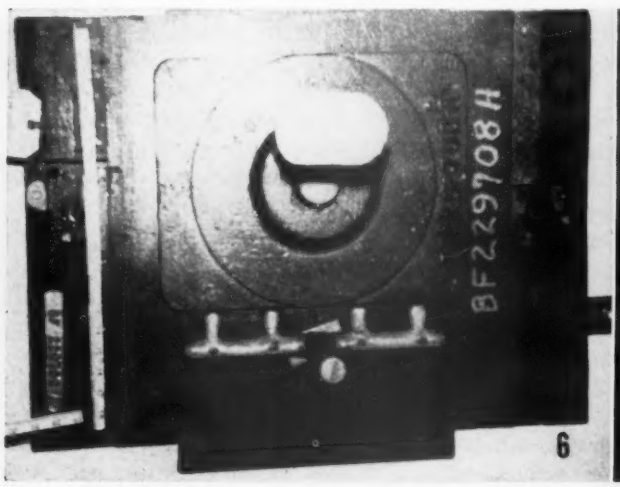


Fig. 6—Direct gates cause turbulence and erosion

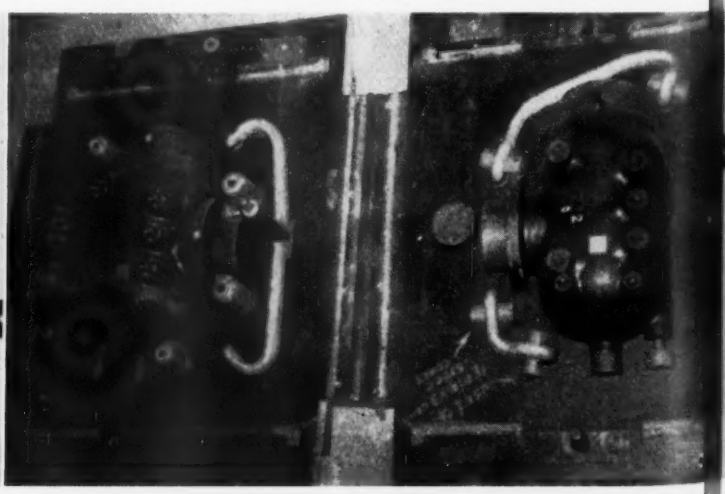
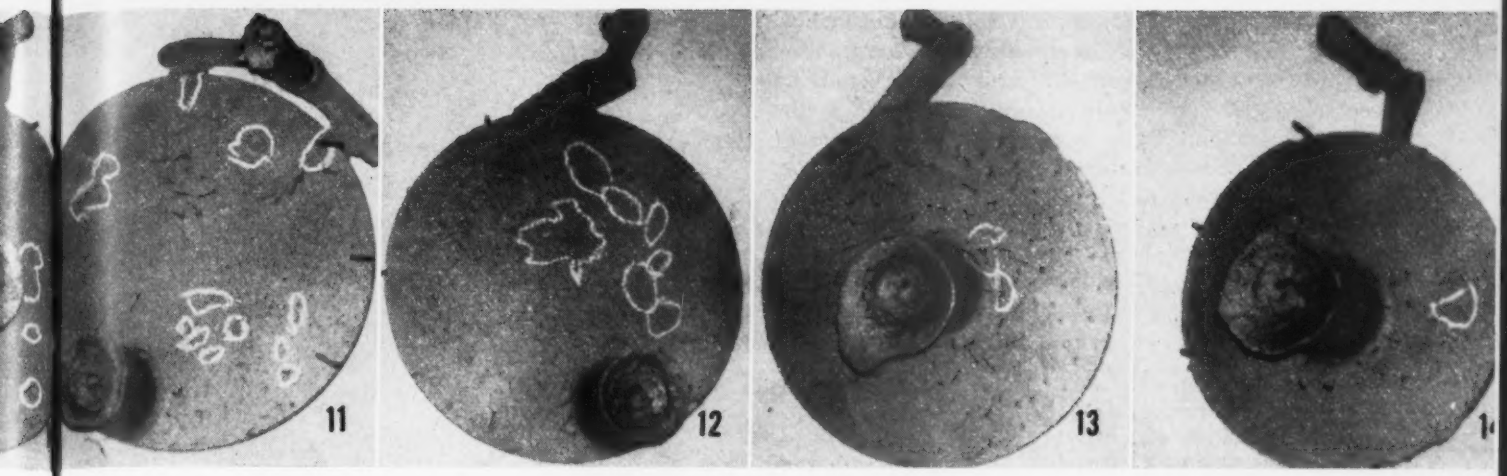


Fig. 7—Changing metal flow as it enters risers



or alloy which has a lower melting point than the transparent material. Transparency of the mold permits observation of metal flow, any turbulence, gas evolution, solidification pattern, etc.

Experimental work to show the efficacy of the procedure for study of metal flow will be discussed. In addition, information is provided on the cost of this type of research as well as results obtained. As a preliminary a suitable pattern for a steel casting was selected which could be gated and headed in several ways. The casting, weighing approximately 150 lb, was 20 in. in diam and 1½ in. thick. It was a shop repair replacement and lent itself to ideal experimentation. Pouring arrangement was comparable to that used in production.

In the experiments conducted all castings were fed with a 5-in.-diam head open to the atmosphere, and placed at different locations relative to the location of the four different types of gates used. These were: Direct gate with one inlet; direct gate with two inlets; swirl gate, and bottom gate. A 1½-in.-diam clay sleeve was used as the down sprue with each gate. This was to prevent erosion in the sprue. Each casting was made in a 28 x 28-in. tight flask with 8-in. cope and drag. Molds were scab-nailed to prevent erosion on any part of the casting. The base of the sprues and the entire gate inlets were cut by hand in green sand. This was done to hold the erosion to one location and to observe the location of "dirt" in the casting where it lodged in the cope.

Several of the molds were tipped and others were made on the flat to observe the effectiveness of tipping with the four types of gates. All castings were poured from a 1300-lb bottom-pour ladle. The pouring velocity averaged approximately 2000 lb per minute. Time required to pour the five molds was: No. 1—0.04-minute; No. 2—0.07-minute; No. 3—0.11-minute; No. 4—0.16-minute; No. 5—0.22-minute.

Average time for the five molds was 0.12-minute, with the first mold poured being subjected to the greatest velocity of approximately 5000 lb per minute. Results obtained with the several procedures may be observed in Figs. 10 through 14. Inclusions are encircled with chalk.

After the castings were made in the foundry, photographs completed and the results tabulated, miniatures of the same castings were subjected to the visual mold study. Close observation indicates that the results obtained by the latter method were comparable in all respects to those of the conditions pre-

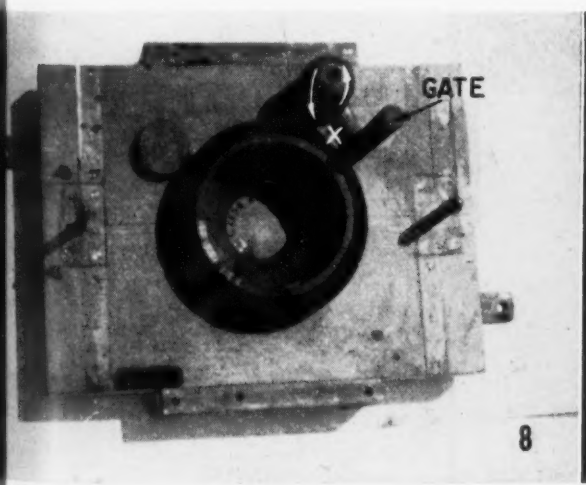


Fig. 8—Whirl gate effective if applied properly

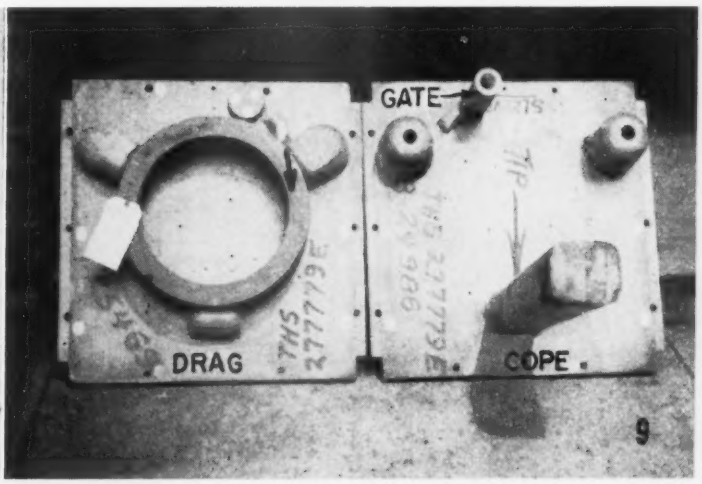


Fig. 9—Change in gate position promotes whirl

vailing during the pouring of steel in sand molds. That is, the actual flow patterns were identical.

Transparent plastic molds were constructed by assembly, and the designs were facsimiles of the original castings. They were made to one-quarter scale to conserve material. To observe the flow pattern mercury was used to simulate the steel. Small pellets of a solid material which would float on the surface of the mercury were placed in the sprue basin. Each mold was poured with an average approximate velocity comparable to those poured in actual foundry practice. The sprues were kept full in every experiment. The results obtained were as follow:

Experiment 1A—Fig. 16A

Gate—1½ in. in diam with one direct inlet 1½ in. in diam. Ratio 1 to 1. *Head*—5 in. in diam with 3½-in. diam contact, located in center. *Pouring time*—0.010-minute, poured flat.

Flow pattern—Simulated by arrows in Fig. 16A, very vilolent; turbulence occurs where secondary streams meet the main stream.

Inclusions—Located at points marked *X*, equidistant from center. No inclusions in primary stream of gate. No inclusions found in head. *Special note*—Metal evolves at gate orifice in fluctuating pulsations. This is believed to account for sand breaking down around gate orifice on the steel castings produced.

Experiment 1B—Figs. 16A and 16B

After comparing the results of the visual mold in Experiment 1A with that of the actual casting produced in the foundry, the mold was tipped to observe any changes in the flow pattern and location of inclusions. Another head similar to that in the center of Experiment 1A was placed at the end opposite the gate, the center head "stopped off," and the mold was tipped approximately the same height (2½ in.) as it would have been if made in the foundry (Fig. 16B).

Fig. 15 — Some of the materials used to make transparent molds for studying flow of liquid metal

Gate—Same as Experiment 1A. *Head*—One at end opposite gate, highest point in mold when tipped. *Pouring time*—0.11-minute, poured uphill. *Mold tipped*—Equivalent to 2½ in. with head up.

Flow pattern—Same as Experiment 1A. Mold filled less violently than Experiment 1A, and gradually from the gate end up to the highest point.

Inclusions—Same location as in Experiment 1A. This was evident because flow pattern was similar.

Experiment 2A—Fig. 17A

Gate—1½ in. in diam, with two direct 1½-in.-diam inlets. Ratio 2 to 1. *Head*—5 in. in diam located at end opposite gate. *Mold tipped*—Equivalent to 2½ in. with head up. *Pouring time*—0.09-minute, poured uphill. Mold filled easily and more readily than Experiment 1A.

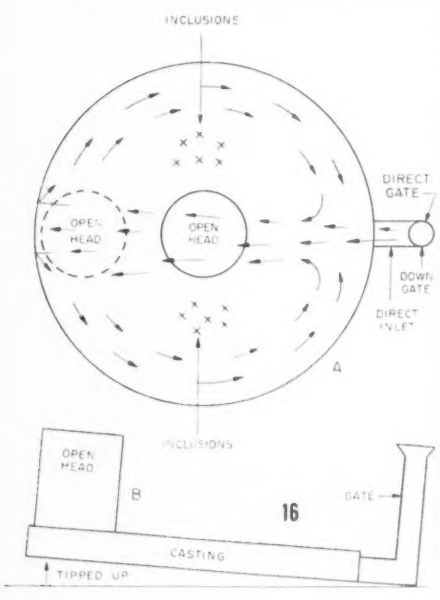


Fig. 16—Experiments 1A and 1B

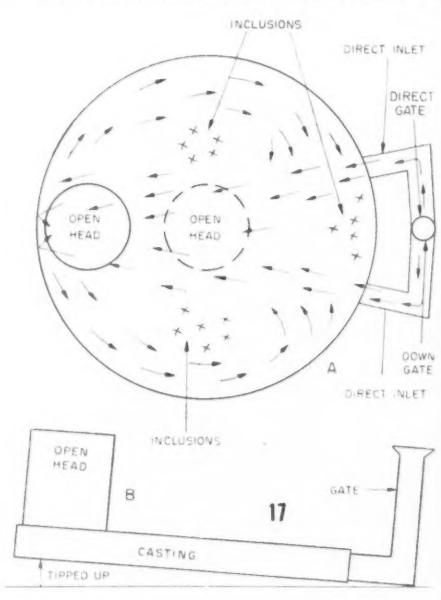


Fig. 17—Experiments 2A and 2B

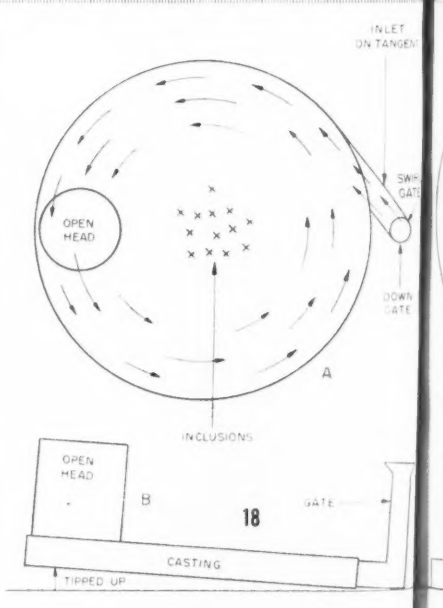


Fig. 18—Experiment 3

Flow pattern—Simulated by arrows in Fig. 17A. Metal flowed smoother and with less turbulence than experiment 1B. Mold filled from gate toward head gradually.

Inclusions—Located at points marked X, equidistant from center, and between the two gate orifices inclusions indicated a "dead spot." No inclusions were in the head.

Experiment 2B—Figs. 17A and 17B

After comparing the results of the visual mold in Experiment 2A with that of the actual casting produced in the foundry, the mold was poured flat to observe any changes in the flow pattern and location of inclusions. Another head similar to that at the end was placed in the center, and the head on the end was "stopped off." That is where the head would be placed if made in the foundry and poured flat.

Gate—Same as Experiment 2A. *Head*—One in center similar to Experiment 1A. *Pouring time*—0.11-minute, poured flat. Mold filled slower than Experiment 2A.

Flow pattern—Same as Experiment 2A. Turbulence existed around gate orifices.

Inclusions—Located same as Experiment 2A. This was evident because the flow pattern was similar. No inclusions were found in the center head or in the path of the two streams of metal.

Experiment 3—Fig. 18

Gate—Swirl gate 1½ in. in diam. One inlet 1½ in. in diam on tangent. Ratio 1 to 1. *Head*—5 in. in diam located on end opposite gate. *Mold tipped*—Equivalent to 2½ in. with head up. *Pouring time*—0.16-minute poured uphill. Mold filled very slowly.

Flow pattern—Simulated by arrows in Fig. 18A. Metal flow was very smooth. No turbulence entering in flow pattern was apparent.

Inclusions—Found directly in center of casting at points marked X. No inclusions were found in head on the end. *Special note*—Metal evolved from gate orifice fluctuating pulsations up to 0.08-minute.

Experiment 4—Fig. 19

Gate—Swirl gate 1½-in. diam. One inlet 1½ in. in diam on a tangent. Ratio 1 to 1. *Head* 5 in. in diam and located in center. *Pouring time*—0.14-minute, poured flat. Mold filled faster than Experiment 3.

Flow pattern—Simulated by arrows in Fig. 19A. Metal flow was very smooth. No turbulence other than flow pattern was apparent.

Inclusions—All inclusions were found in center head. Casting was free of all inclusions. *Special note*—Metal evolved from gate orifice in fluctuating pulsations up until 0.10-minute.

Experiment 5—Fig. 20

Gate—1½ in. in diam with 1½ in. in diam inlet under head. Ratio 1 to 1. *Head*—5 in. in diam located in center of mold. *Pouring time*—0.16-minute, poured flat. Flow was very slow.

Flow pattern—Simulated by arrows in Figs. 20A and 20B. First metal evolves in a very violent action. After pouring was started it flowed smoothly toward outside circumference. All turbulence occurred in the head from fountain-like jet produced by inlet.

Inclusions—First metal introduced some inclusions which were trapped at outside circumference. Inclusions were also found in the gate.

Experiment 6—Fig. 21

After comparing the results of the visual mold in experiment 5 with that of the actual casting produced in the foundry, the mold was tipped to observe any changes in the flow pattern and location of the inclusions. In this the center head was "stopped off" and one similar to (*Please turn to page* 200)

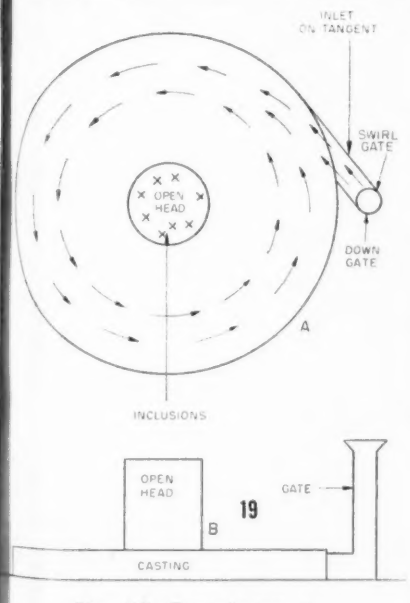


Fig. 19—Experiment 4

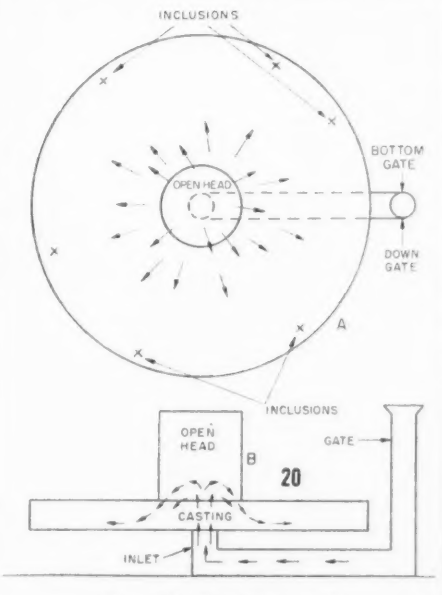


Fig. 20—Experiment 5

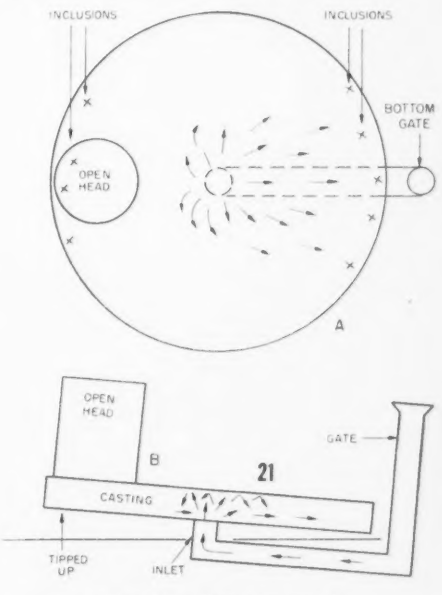
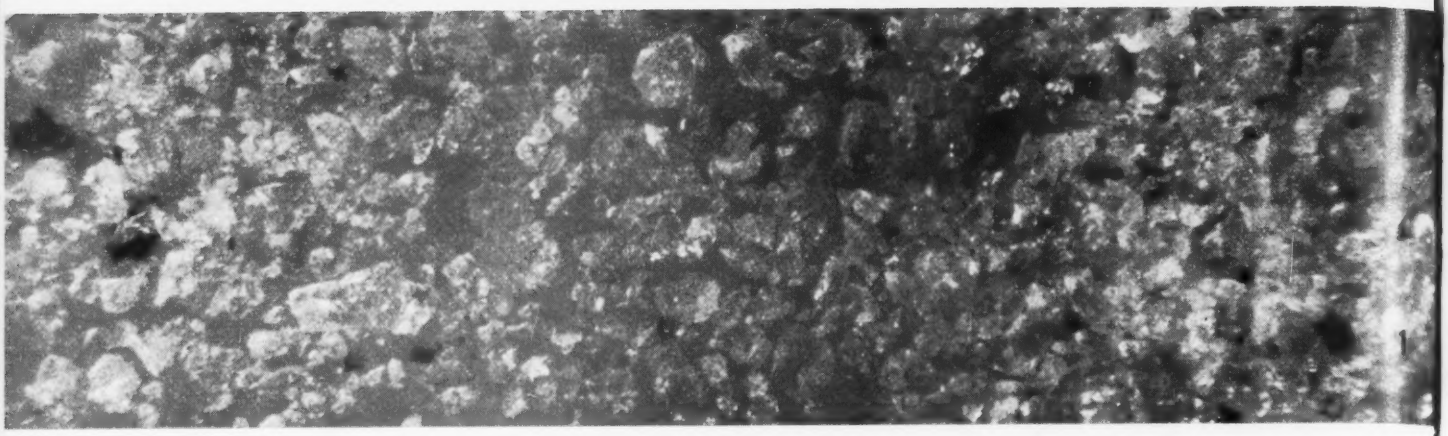
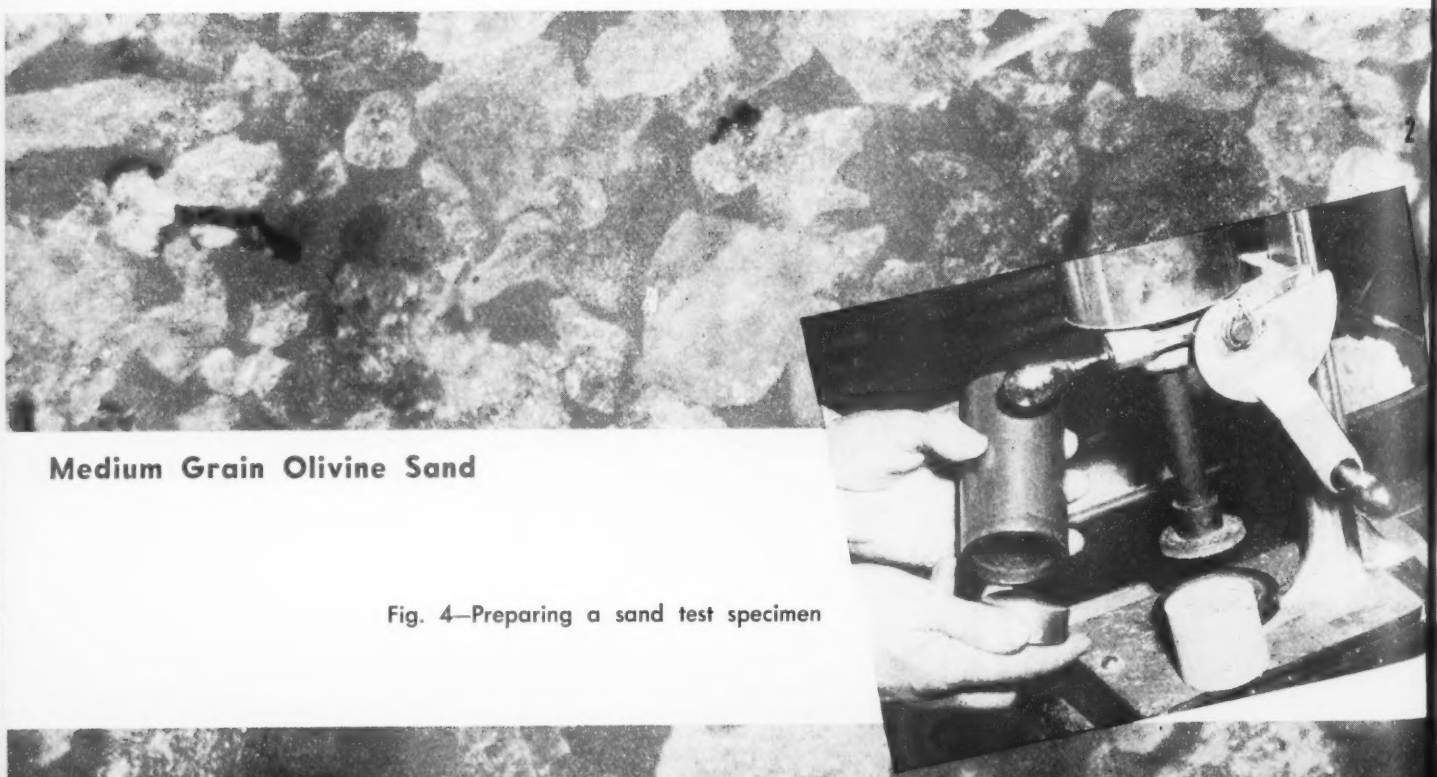


Fig. 21—Experiment 6



Fine Grain Olivine Sand

Casting Surfaces Produced in Olivine Moldings



Medium Grain Olivine Sand

Fig. 4—Preparing a sand test specimen

Coarse Grain Olivine Sand

The authors describe tests conducted to study the quality of casting surfaces produced in olivine molding sand. Methods employed are offered as a possible standard for casting surface investigation

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Professor of Mechanical Engineering
and A. M. NELSON
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Sand

REGARDLESS of the many influences that molding sand exerts, the excellence of a casting continues to be judged by its surface appearance.

The experimental program in the Foundry Division of the Mechanical Engineering Department at the University of Washington has proved the utility of olivine as a molding sand aggregate. High fusion characteristics coupled with low expansion potential, in addition to the virtual elimination of health hazards, commend olivine to the serious attention of the foundry industry, generally. However, in considering this material management has invariably asked about surface quality of the resultant castings.

In an endeavor to give a significant answer to this repeated question, a series of tests were inaugurated and carried to completion over the past several months. It is believed that the plan of investigation, coupled with the techniques employed, offer a novel departure and one that might well form the basis for a future engineering standard in connection with casting surface study.

The olivine aggregate used throughout the research has been obtained from the Twin Sisters area in Skagit county, Washington, where it occurs primarily as a rock formation. This material is ground in a roll crusher and the resultant material is classified as to grain size. It must be recognized that the olivine material is entirely free of bond and, therefore, the olivine molding sand used is a synthetic one. Consequently, it has been possible to make an accurate investigation of grain size and distribution, moisture and clay content.

Three classifications of grain were obtained by water classification. The screen analyses of these sands are given in Table I. A micrograph at about 30 magnification of each of these classifications appears in Figs. 1, 2 and 3, respectively. Western bentonite was used and for each classification a series of tests were made for clay contents of 1, 2, 3 and 4 per cent by weight of dry sand. This range was chosen because it includes the range of best workability. Greater clay contents make the aggregate too strong to work well.

The aggregate was mulled in 10-lb batches in a laboratory muller and the moisture developed to about 6 per cent. Tests were made of moisture, permeability, flowability, green shear, green compression, deformation, surface hardness and dry shear. The specimen in Fig. 4 was made by dropping the rammer weight three times into the specimen tube in which a convex machined button had been placed. These series of tests were repeated for decreasing moisture

TABLE I—Screen Analysis of Sands

U.S. Screen No.	No. 1 (Fine)	No. 2 (Medium)	No. 3 (Coarse)
12	...	...	Trace
20	Trace	4.2	15.4
30	2.4	12.6	26.4
40	4.9	19.6	27.3
50	8.6	23.4	16.6
70	10.7	24.4	8.1
100	11.0	10.6	3.4
140	12.9	3.3	1.9
200	16.0	Trace	Trace
270	9.2	Trace 1.9	Trace 0.8
Pan	24.2	Trace	Trace

Fig. 5—Test specimens placed in mold

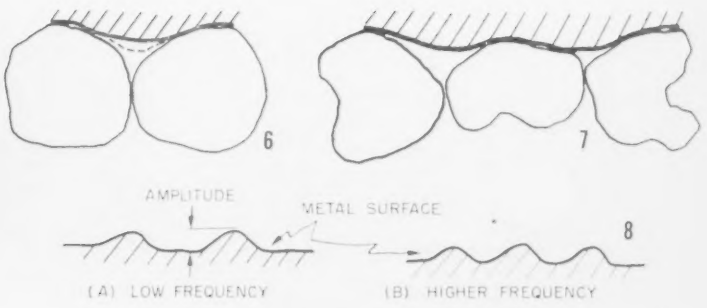


Fig. 6—Two sand grains at the metal mold interface
Fig. 7—Angular grain aggregate increases roughness
Fig. 8—Nomenclature for describing casting surface

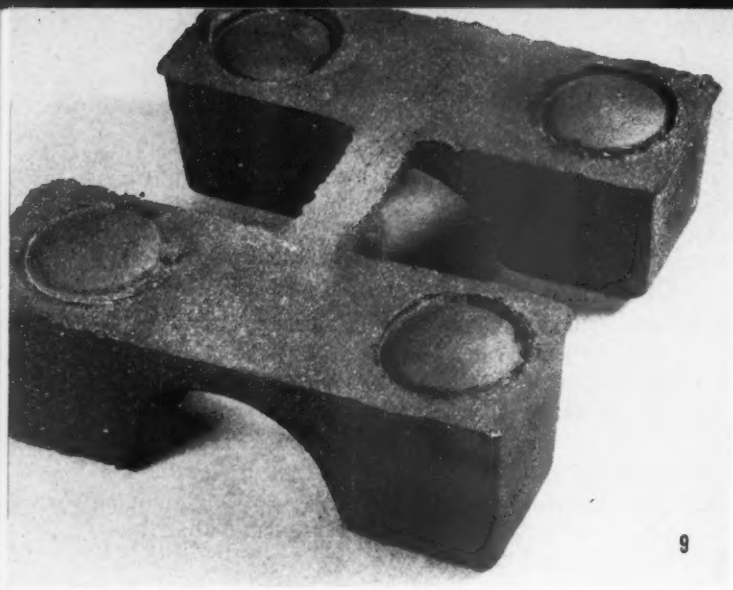


Fig. 9—Test casting made to study surface roughness

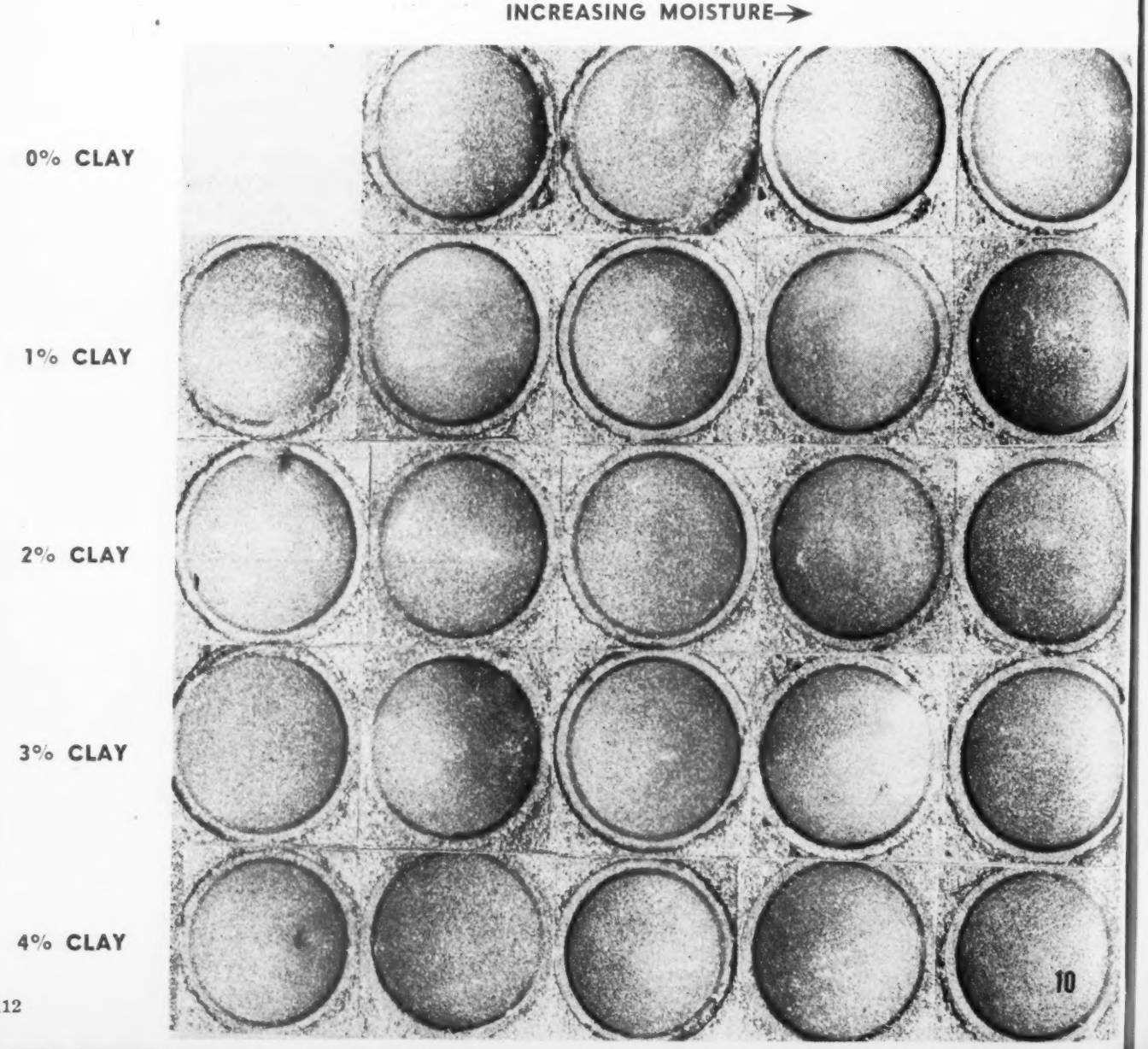
Figs. 10-12—Specimens made from different grades of sand and varying contents of clay and moisture. Fig. 10, fine grain sand; Fig. 11, medium; Fig. 12 coarse

increments of about 1 per cent until approximately 2 per cent was reached. The dry compression strength was checked for some of these mixtures.

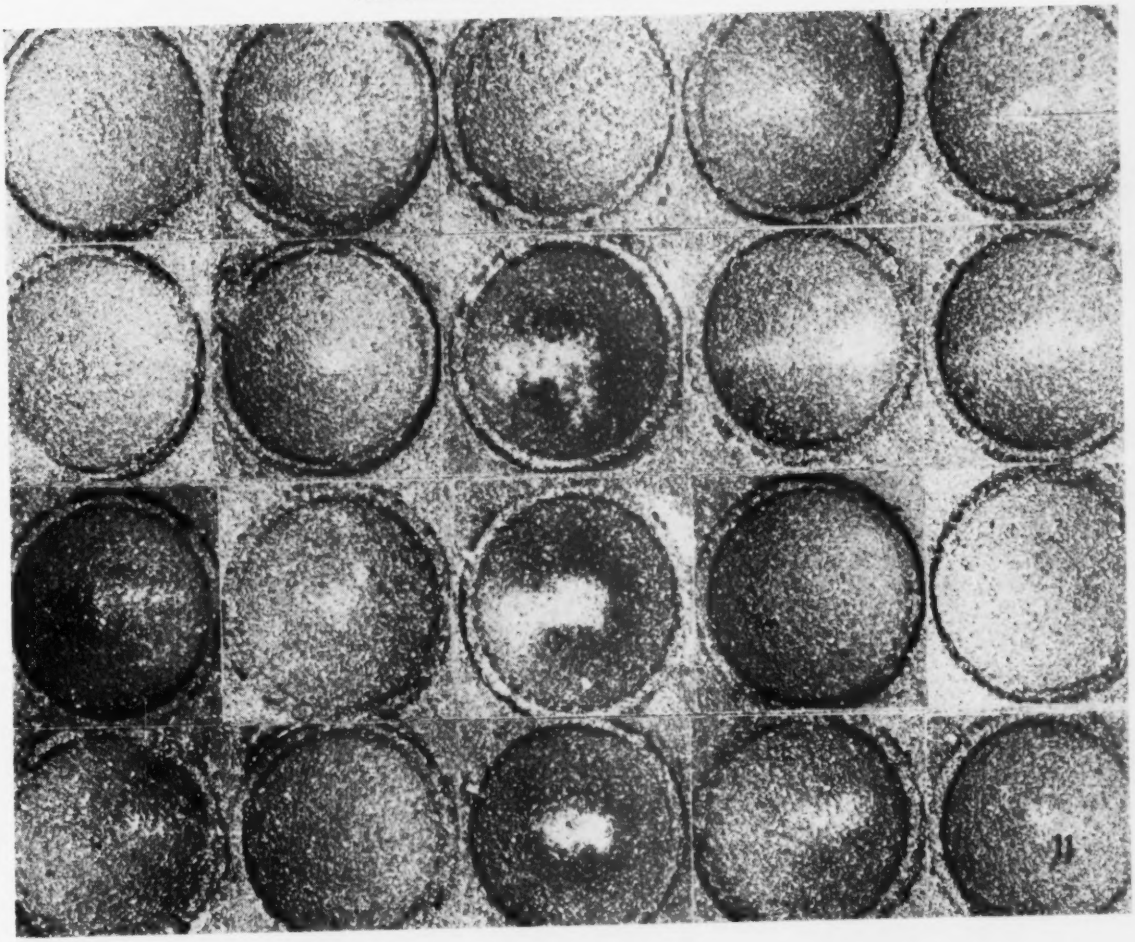
After the entire series of tests had been made, the special surface specimens referred to above were placed in molds (Fig. 5) designed to hold four samples in a manner whereby the metal head and gating condition for each would be identical. One place in each mold was taken by a control specimen made of heap sand. These molds were then poured with cast iron melted in a direct arc furnace. The resulting casting shown in Fig. 9 weighed 20 lb. The surfaces were subsequently compared for differences in roughness.

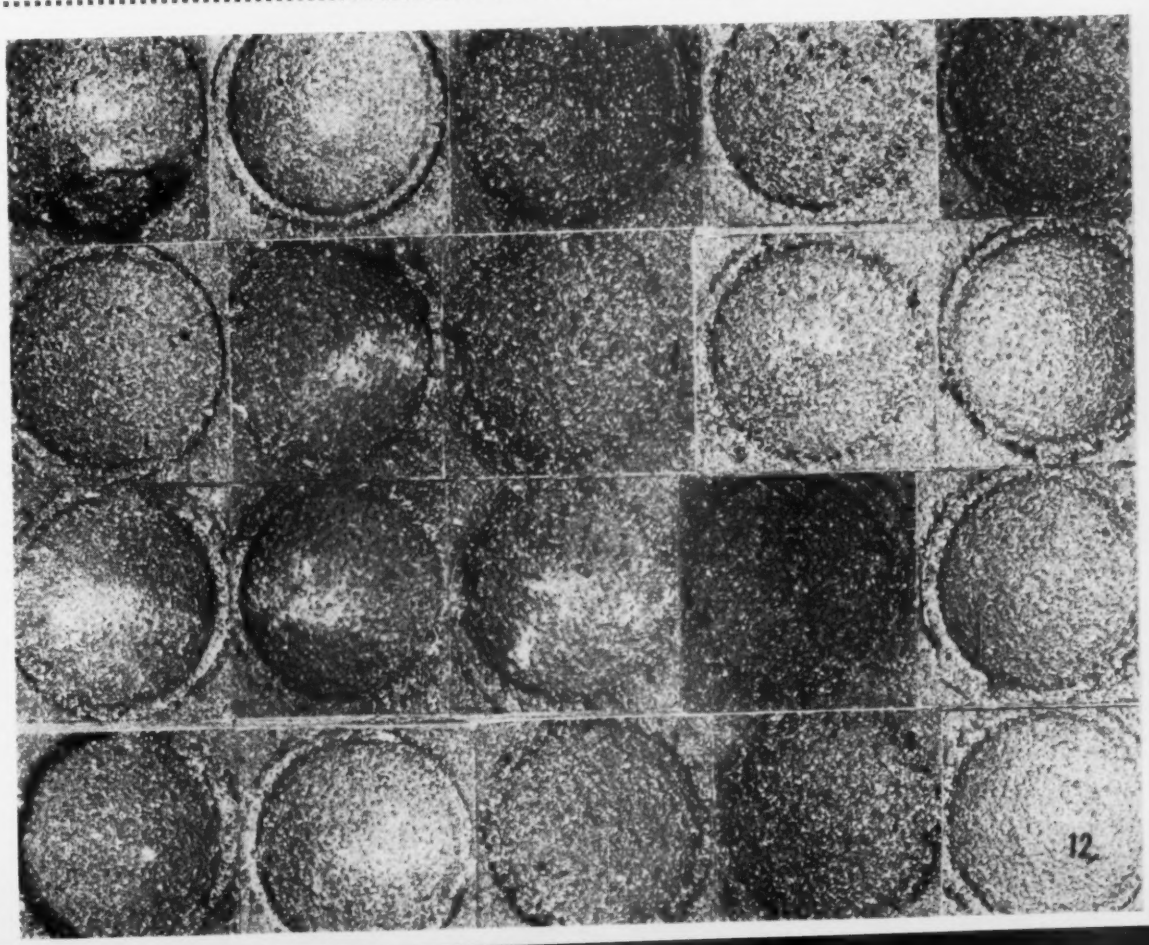
Special Surface Tests—The surface insert test is described in the introduction to the standard laboratory tests. The specimens when placed in the molds had been air dried for several days. Tests made previously indicate that air drying gives smoother surfaces than the green condition.

Fine Sand—The fine grain classification showed no significant change in roughness for the entire range of clays and moistures as Fig. 10 indicates. All these specimens stripped (*Please turn to page* 260)



INCREASING MOISTURE→





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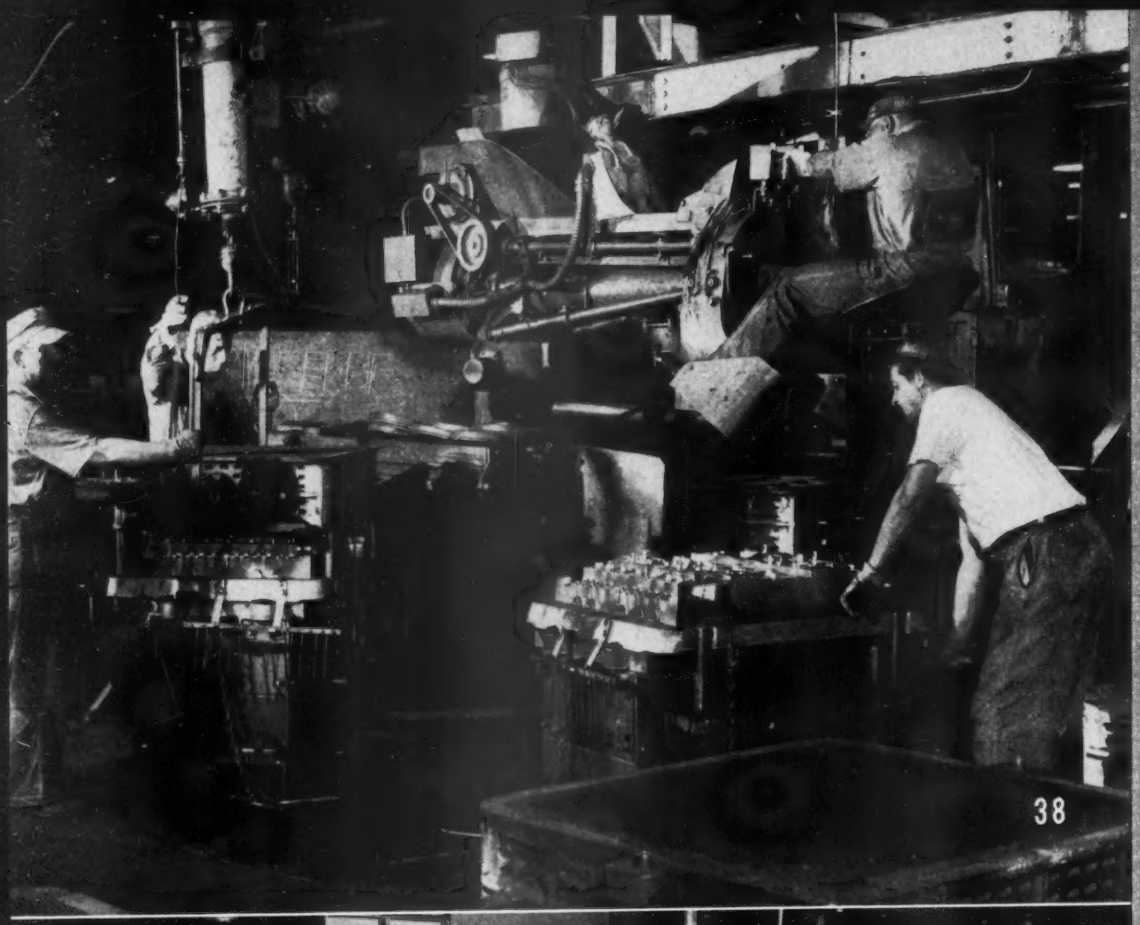


Fig. 38 — Cylinder block molds on turntables are rammed with sandslingers

Fig. 39—Drag molds are blacked and skin dried previous to core setting

Fig. 40 — Cylinder block cores are placed in jigs for correct alignment

Molding and pouring cylinder blocks and smaller castings is described in this third of four articles on the modernized Studebaker gray iron foundry. Extensive facilities are employed to control dust, smoke and fumes

STUDEBAKER

Doubles Foundry Capacity

CYLINDER block copes and drags at the modernized Studebaker Corp. gray iron foundry are rammed at separate molding stations. These stations consist of a turntable with pin pushoff machines and a sandslinger which is hydraulically controlled by an operator riding the head (Fig. 38).

After the drag is placed on the mold conveyor it is blacked as it passes through a ventilated spray booth (Fig. 39) and then through a group of swinging skin-drying gas torches on its way to the core setting area. The gas valve for each torch is individually operated by a roller, contacting the flask so that the torch is fired only when the mold is passing it. All of the cores set in the cylinder block mold are jig set (Fig. 40), excepting gear and bell end and strainer cores. The mold is closed at the cope molding station and passes into the pouring zone where it is poured by the hot metal telpher crane operator.

The pouring hoods and mold conveyor smoke hoods are provided with adjustable louvers to attain uniform exhaust velocities throughout their length. They are also equipped with compensating air supply nozzles at their outside edges. Seventy to eighty per cent of the total air exhausted through these hoods is unheated air supplied through the nozzles by stacks from above the roof in the wintertime. During hot weather adjustment of a gate in the stack causes the supply air to be drawn from the stagnant hot areas high up in the roof trusses. This accomplishes a considerable saving of heat in the winter and helps to cool the building in the summer.

The compensating air is directed diagonally down from the edge of the hood and is pulled in across the mold (Fig. 50). This curtain of supply air prevents convection drafts from passing out of the range of the exhaust currents and directs them downward to a point where the drift of air into the hood from the building catches the fumes and conveys them into the exhaust louvers. The inside vertical wall of these hoods extends to the floor to prevent drafts from passing through and beyond the fume capture area. The outside face of the pouring hood is open but the hot smoke and fume is confined by the curtain of supply air.

The compensating air curtain permits the outside vertical wall of the mold conveyor smoke hood to be stopped short of the floor and above the top of the mold conveyor tray so that this conveyor is clearly visible throughout its entire length. The bottom half of both outside and inside vertical partitions of all hoods is suspended on hinges in sections so that the mold conveyor is readily accessible from both sides for repairs.

To provide for working space on both sides of the mold conveyor for the removal of flask clamps, that portion of the mold conveyor smoke hood between the pouring zone and cope removal station is equipped with compensating supply nozzles on both

Fig. 41—Gear and bell end cores for the cylinder blocks are placed in the mold by hand

Fig. 42—Cylinder block cope is closed over a cored-up drag mold

Fig. 43—Confine and exhaust fumes with hood and air curtain

Fig. 44—Clamp removing area is exhausted by compensating hood

sides of the mold conveyor and a multiple-louver exhaust duct above the mold conveyor. The supply air curtain holds the smoke and fumes within the limits of the hood as effectively as if the sides of the mold conveyor hood were closed to the floor. As the mold advances from the pouring zone and before it enters the cope removal station, the flask clamps are removed and the mold is broken. At the cope removal station an air cylinder engages the cope flask with grapple tongs and elevates it to clear the mold (Fig. 45). A horizontal air cylinder moves the cope flask to a vibrating shakeout where the grapple hook disengages the flask as it is lowered. The flask is discharged from the end of the shakeout and returned to the cope molding station on a roller conveyor and drag chain.

The open drag is subjected to additional cooling time under a smoke hood and then passes a louvered side exhaust hood where the casting is removed by an air hoist and jib crane and placed on a trolley chain cooling conveyor. Beyond this point a pneumatically operated frame slides the drag from the mold conveyor tray onto a vibrating shakeout where the sand is removed and the drag flask is slid back onto the mold conveyor and returned to the drag molding station.

The exhaust from all points of heavy dust concentration is passed through multiple stage wet dust collectors while the ventilation of smoke hoods, which carry little solids, is exhausted directly through the roof. For proper ventilation and control of smoke, fumes and dust, large volumes of air are exhausted and only a portion of this can be compensated for by supply air at the hoods or capture points. The original heating and ventilating system distributes much of the required supply makeup air through underfloor ducts with outlets at columns throughout the building. With the installation of new production units and extensive ventilating equipment, it was necessary to supplement the original ventilating equipment with supply air fans and heating coils at strategic points in the roof to accomplish building ventilation balance.

An inadequate and obsolete sand handling system, serving both cylinder block lines, was replaced by two modern sand handling and preparing units without loss of production.

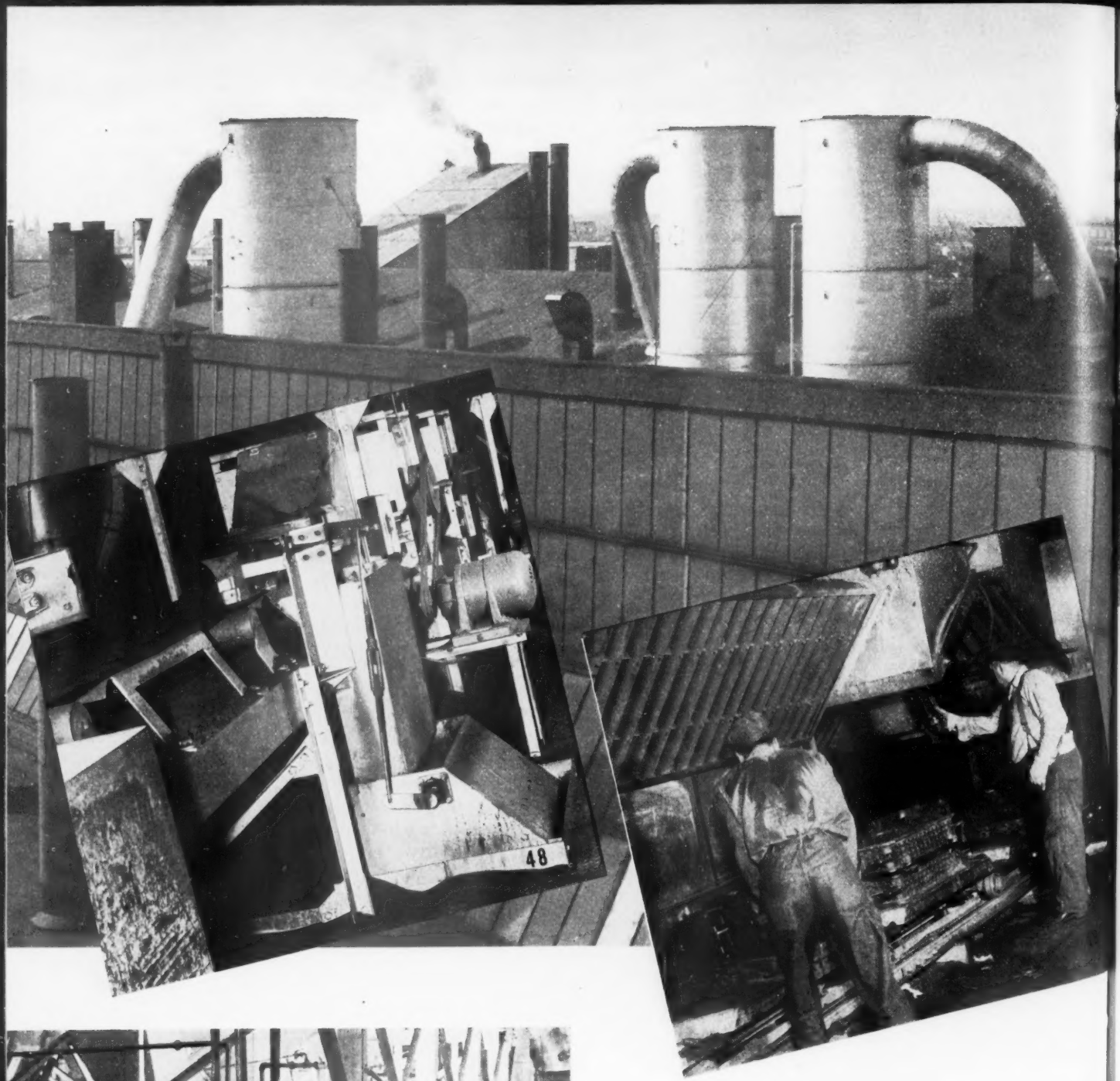
Manifolds, bearing caps and small intermediate castings are made on a new molding line, equipped for the full production of three cope and drag teams. There are four cope and drag molding stations so that a cope and a drag machine are always available for repair or pattern change. Jolt-squeeze, drop strip molding machines with 21-in. squeeze cylinders are used on both copes and drags. The pattern mounting is standardized throughout the foundry, so that heads or flywheels that are normally run on two other intermediate lines can be readily switched to this molding unit or vice versa.

Four drag molding stations are arranged in line on the inside of one leg of the mold conveyor. Cores are jig set around the end of the conveyor loop. Then copes are closed from molding stations inside the other leg of the mold conveyor. Molds are handled from machine to conveyor by air hoist jib cranes. Molding stations are supplied with sand from an overhead prepared sand delivery belt by automatic plows (Fig. 48).

When prepared sand is delivered to a mill hopper by the muller it feeds uniformly onto the belt under an adjustable strike-off plate. An inclined portion of the belt raises the sand to a suitable height for delivery to the molders, where the belt levels off to horizontal. It then passes through an aerator consisting of two pairs of diagonally bladed cutting cylinders with a weighted crushing roller between the pairs of cutting cylinders. The cutting cylinders just clear the belt and are motor driven at high speed in the direction of sand travel. The diagonally mounted blades windrow the sand on the belt as they violently

Fig. 45—Cope is lifted off with grapple tongs and delivered to shakeout by means of air cylinders

Fig. 46—Casting removed from open drag in front of an adjustably lowered side draft exhaust hood



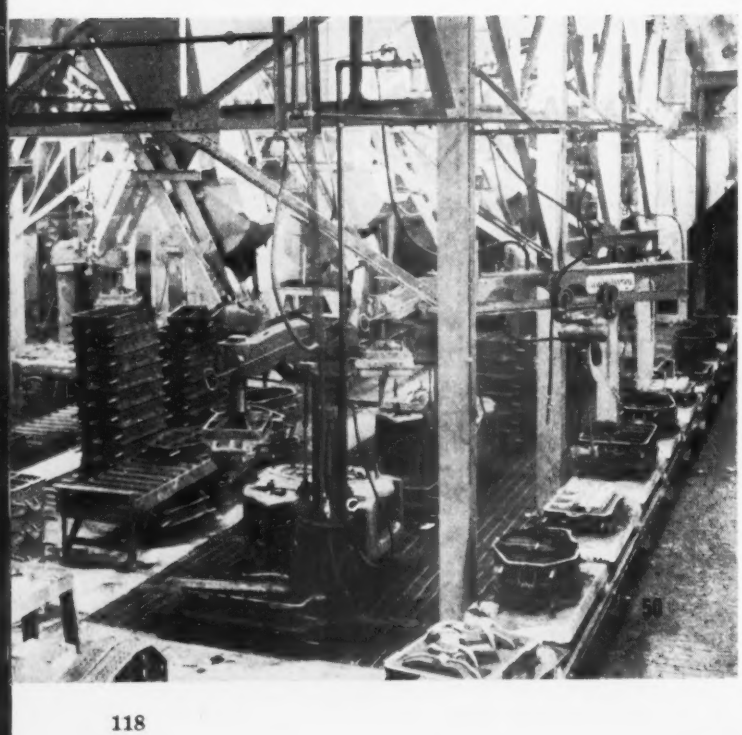


Fig. 47—Heavily dust laden air is exhausted through multiple-stage dust collectors, and smoke hoods are exhausted by stacks extending through roof

Fig. 48—Molding stations are supplied with sand by automatic plows which sweep it off the belt

Fig. 49—After breaking mold, cope is booked-off

Fig. 50—Spill grates surround line molding machines

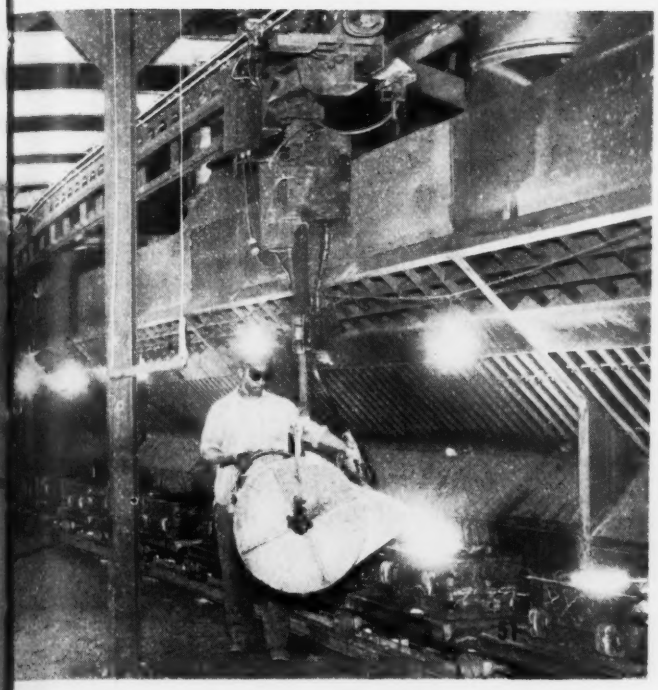


Fig. 51—While pouring, ladle trolley engages overhead drag chain synchronized with mold conveyor

manipulate it. The crushing roller is motor driven so that its peripheral speed is the same as the belt speed and squeezes out the soft lumps for more effective manipulation by the subsequent cutting cylinders. This equipment is very effective in eliminating lumps and also materially increases the flowability and green strength of the sand.

Each automatic plow assembly is balanced by an adjustable counterweight. When there is no sand in the upper part of the molder's hopper the plow rests lightly against the sand delivery belt in position to plow sand off into a vertical chute over the hopper. A shaft mounted in antifriction bearings extends across the top of the molder's hopper, just out of line with the vertical sand chute. A deep baffle plate extending across the hopper is rigidly suspended from the shaft in a normally vertical position. The baffle shaft is connected to the counterweight extension of the plow arm through a crank arm and adjustable link. As the hopper is filled the sand piles against the baffle, exerting a pressure which rotates the shaft sufficiently to raise the plow through the linkage. Immediately beyond the automatic plow a small fixed plow forces the sand back from the edge of the belt to avoid spillage between hoppers.

The molding machines are mounted on shock absorbing pads with through bolts to 2-in. thick steel plates which are supported from independent foundation slabs at the belt tunnel floor level by heavy, well-braced A frames that straddle the spill belt. The spill belt runs under the center line of the molding machines. By an arrangement of three floor hoppers per molding machine and one extra hopper, spill grates completely surround the molding machines (Fig. 50). The floor hoppers are entirely independent of the molding machine supporting structure, thus avoiding a sounding-board, noise producing effect.

The cope spill belt delivers to a cross belt, which also receives any overflow from the overhead prepared sand delivery belt through a chute and then delivers to the drag spill belt. The drag spill belt receives hot sand from a drag shakeout, a castings shakeout and a cope shakeout, after it has passed the spill hoppers, so that the belt is protected from the hot shakeout sand and occasional hot iron, by the cool spill sand. A bucket elevator raises the shakeout and spill sand to an overhead screen and storage hopper.

A volumetric batch hopper measures the sand into the 8-ft sand muller. Measured rebonding binders are introduced by a bond hopper in the side of the mixer dust housing and water is introduced through a meter for temper control. The sand mixing operation is controlled by a cycle timer which assures uniform sand conditioning.

Operated from Control Cabinet

A control cabinet on the mixer platform contains all of the interlocked starters for the entire molding unit. Start and stop buttons and signal lights for each controller are mounted on the cabinet doors.

The molds are poured with power-travel, power-hoist trolley ladles. An overhead drag chain, synchronized to the mold conveyor speed, is engaged by a solenoid operated pin on the ladle trolley during the mold pouring. (Fig. 51). These ladles are filled from bull ladles on the hot metal distributing system.

A pouring hood equipped with compensating supply air nozzles extends the full length of the pouring zone, and a compensating smoke hood ventilates the cooling zone travel of the mold conveyor. The flask clamp removal station and the cope shakeout are exhausted by hoods with adjustable louvers for uniform distribution of ventilating velocities.

The cope flask is hooked off of the mold (Fig. 49) by an air-cylinder-operated hook which is guided to engage the edge of the cope flask. Then the handle is squeezed which actuates the air cylinder, raising the near side of the cope flask from the mold and dumping it over a buffer bar on the far side of the mold conveyor so that it drops onto the vibrating shakeout upside down. The flask is discharged from the shakeout onto a roller conveyor and drag chain and returned to the cope molders.

After further travel through a hooded cooling zone the open drag passes a casting removal station. The casting is manually lifted out of the mold with a chain-suspended forked bar and pitched onto a vibrating shakeout. The castings feed over the end of the shakeout into cooling baskets provided with bails for suspension on the hooks on a trolley chain cooling conveyor.

After passing the casting removal station the drag flask is pushed off of the mold conveyor and onto a vibrating shakeout by an air pusher which is automatically actuated. The flask is discharged from the shakeout onto a roller conveyor and drag chain and returned to the drag molders.

(To be concluded next month)

CORRELATION OF

Structure and Test-Ba

OF 85-5-5-

This is the second of a series of three articles based on investigations sponsored by the Brass and Bronze Ingot Institute

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THE preceding article of this series contained an account of the history and a description of the microradiographic technique. A comparison was also made between the microradiographic and metallographic techniques applied to 85-5-5-5 alloy. It was shown that the microradiographic technique is superior to metallographic methods applied to 85-5-5-5 alloy because the lead and porosity are clearly differentiated and the size and shape of the porosity and lead particles are delineated on the microradiograph. This advantage is a direct result of the investigation and reproduction of a section of finite thickness.

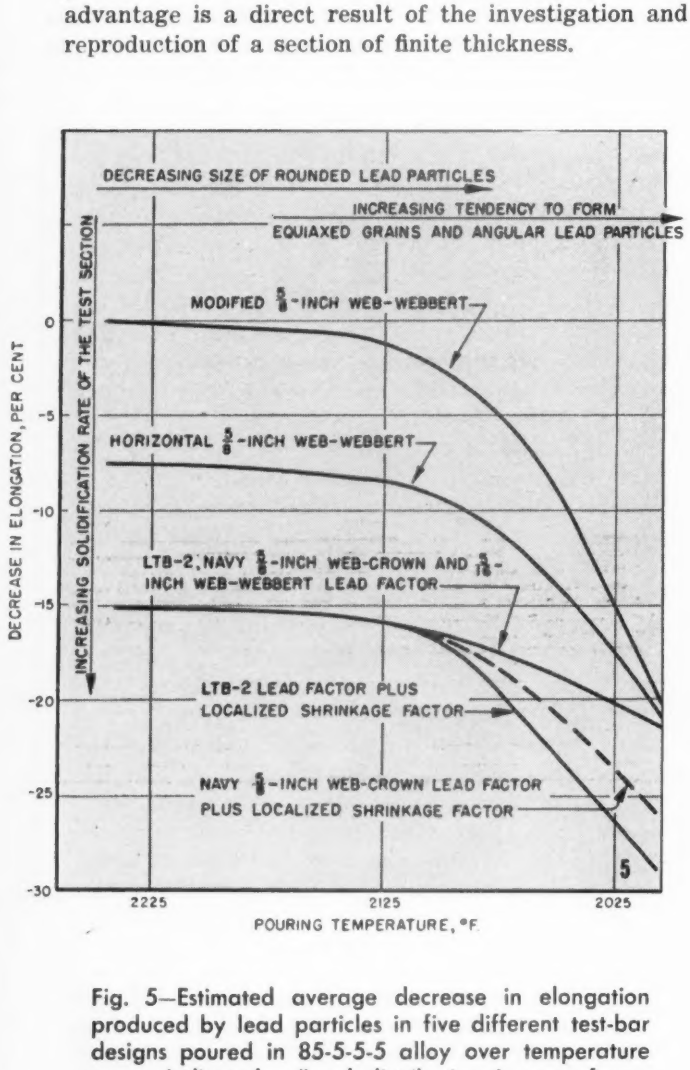

Fig. 5—Estimated average decrease in elongation produced by lead particles in five different test-bar designs poured in 85-5-5-5 alloy over temperature range indicated. (Lead distribution is most favorable in modified 5/8-in. web-Webbert poured from high temperature. Such lead particles probably have little or no adverse effect on elongation)

The primary purpose of using any method of examination of the structure of a casting is, of course, to determine the reason for the effects of any given factor under investigation. Because the tensile properties of a casting of a given composition depend only upon its structure, it should be possible to obtain a fairly good correlation of structure with the tensile properties. The structural features may be macroscopic, microscopic, or submicroscopic. In the latter case, they are too fine to be observed.

If these submicroscopic structural features have an effect upon the tensile properties, then a rather poor correlation of tensile properties and structure will be obtained. In this investigation, the microradiographic studies were limited to about 15 diameters, but these were supplemented with metallographic investigations up to 1000 diameters. It was found, however, that the structural features of 85-5-5-5 alloy could best be studied at about 15 diameters, at which magnification the entire cross section of a test bar could be reproduced and studied. This was very important, because the structure of a test bar varies considerably from point to point, and it is only when the structure of the entire cross section of the bar is observed that a good correlation with properties is obtained. No fine microstructural features, visible only at high magnification, were found to be of significance.

In general, 85-5-5-5 alloy consists of three main structural features:*

1. The copper-zinc-tin solid solution forming the background or matrix.

2. The lead particles occurring as a discontinuity,

* Occasional particles of the delta phase occur if tin is on the high side of the specification or if cooling rate of the casting is rapid enough to prevent absorption of the delta phase. This phase was not present in the alloys studied in this work.

Properties

ALLOY

practically without strength, mainly interdendritically and, to some extent, between the grains or boundaries of the dendrites.

3. The voids, present generally in the form of microporosity. These voids also occur interdendritically and at the boundaries of the grain or dendrites. The mechanism of the formation of this microporosity was described in a previous article.[1,2,3]

When interpreting the microradiographs, it must be borne in mind that the x-ray film is enlarged to form a print and, during this process, the shading is reversed from that of an ordinary x-ray film. Thus, in the enlarged microradiograph, the alpha solid solution forms a shaded matrix in which the porosity occurs as light areas and the lead as dark particles. These three different structural features of the alloy are, therefore, readily distinguished.

The design of the various test bars referred to in the paper and the effect of various factors on their properties have been described previously.[4] For ready reference, Fig. 6 illustrates the general design of the test bars studied. In general, the tensile properties of 85-5-5-5 alloy test bars of a given specific composition are mainly dependent upon the amount, size, and shape of microporosity present, the size and shape of the lead particles present, and the occurrence in cast-to-shape test-bar designs of localized shrinkage. The interpretation of the size and shape of the lead particles in the accompanying microradiographs requires some experience. The results presented in this paper are based on examination of microradiographs enlarged to 13 diameters. The general principles illustrated in part by the microradiographs contained in this article are summarized as follows.

Microporosity—Because most test bars are fairly well fed, the microporosity occurs mainly as a result of gas evolution during solidification of the melt; therefore, the greater the gas content of the melt in the pot, all other factors the same, the greater the amount of microporosity. For this reason, test bars can be employed as the measure of melt quality in the pot, provided the test-bar procedure is rigidly standardized. In general, the greater the amount, the coarser and more angular the microporosity, the more adverse the effect it has upon both the tensile strength and elongation values of the test bar.

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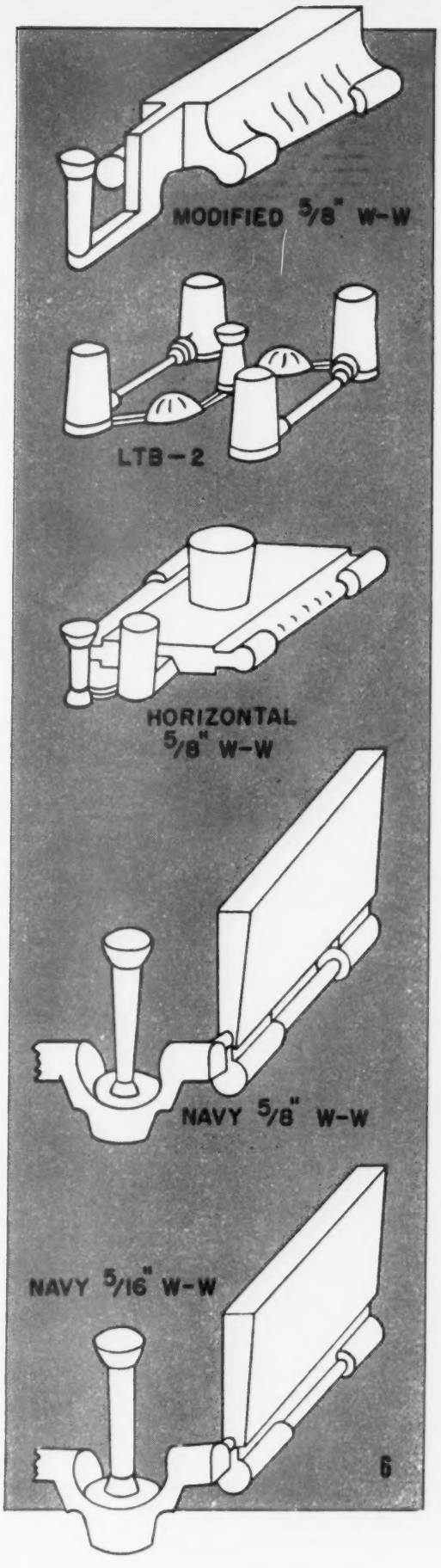
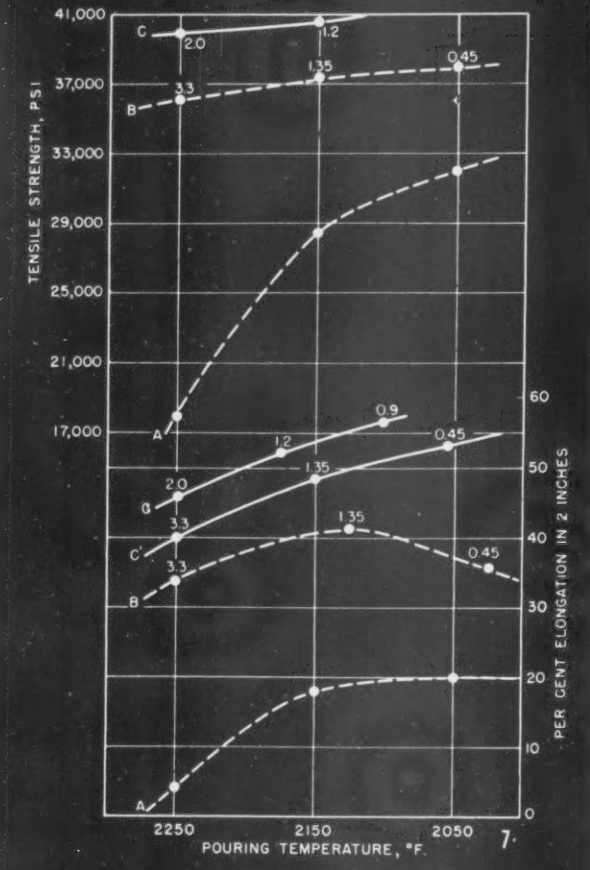
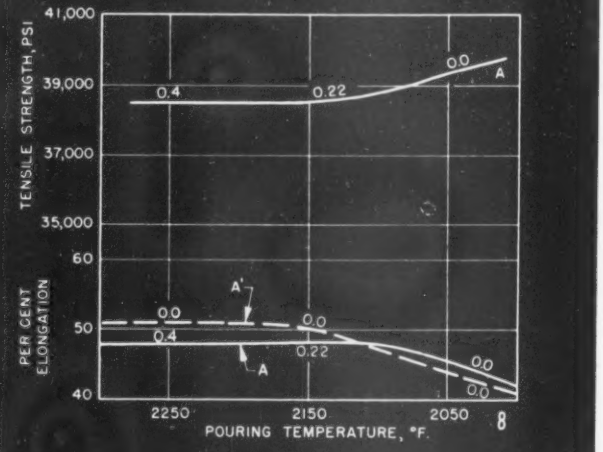
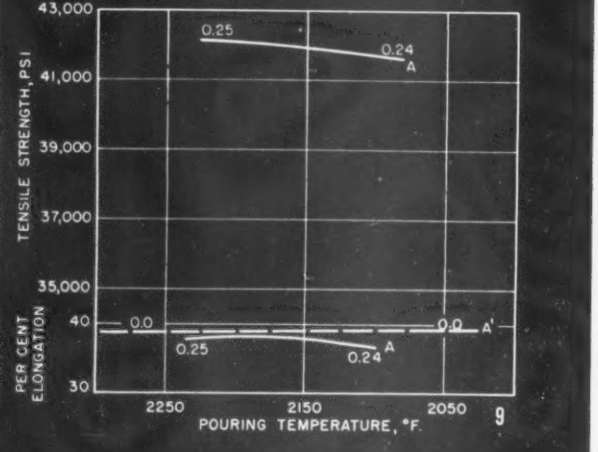


Fig. 6—Various designs of test bars studied







For a given melt, the quantity of microporosity increases with increasing section thickness or decreasing solidification rate and with increasing pouring temperature, but this increase with increasing pouring temperature is more marked in light sections than in heavy sections. Therefore, both the tensile strength and elongation values obtained on test bars tend to increase with increasing solidification rate or with decreasing pouring temperature, provided there is no compensating factor to offset the improvement in soundness.

Lead Particle Size and Distribution—In 85-5-5-5 alloy, the quantity of lead, of course, remains constant, so that only the size and shape of the lead particles need be considered. At high pouring temperature at which coarse or columnar grains are obtained, the lead particles tend to be rounded unless the mass of the bar is substantially greater than that of the Modified 5/8-in. web-Webbert.[5] For example, a heavy test bar such as the Navy keel block apparently does not tend to produce rounded lead particles even at high pouring temperatures. On the contrary, the lead particles in the Navy keel block poured at all normal temperatures tend to be quite angular.

With a decrease in the pouring temperature of bars having a solidification rate at least as rapid as that of Modified 5/8-in. web-Webbert, there is a slight tendency for the rounded lead particle size to become slightly finer, though this difference is not marked. When, however, a pouring temperature near 2050° or lower is reached, and the grains become relatively fine and equiaxed, the lead particles invariably become angular. The general effect of decreasing pouring temperature, then, in all test-bar designs having a solidification rate equal to or faster than that of the Modified 5/8-in. web-Webbert is to produce round-

Fig. 7—Effect of lead content and pouring temperature on tensile properties of horizontal 5/8-in. web-Webbert bars. Numbers indicate per cent voids. Curves *A*: "Gassy" melts prepared and poured under glass cover. Average of three heats. Curves *B*: Same as *A*, but melts have low gas content. Average of 27 heats. Curves *C*: Lead-free alloy, otherwise identical to 85-5-5-5. Average of four heats with low gas content. Curve *C*[1]: Estimated properties obtainable with lead-free alloy of low gas content. Estimates based on values of lead factor represented by Fig. 5

Fig. 8—Tensile strength and per cent elongation of sound, nearly porosity-free, horizontal 5/8-in. web-Webbert 85-5-5-5 test bars. Numbers indicate per cent voids. Curves *A*: Average value on two heats. Curve *A*[1]: Estimated per cent elongation of porosity-free bars, based on porosity factor in Fig. 10

Fig. 9—Tensile strength and per cent elongation of sound, lead-free alloy otherwise similar to 85-5-5-5 alloy. Numbers indicate per cent voids. Data for horizontal 5/8-in. web-Webbert test bars. Curves *A*: Average data on four heats. Curve *A*[1]: Estimated alongation of sound 85-5-5-5 alloy test bars having coarse, rounded (i.e., very favorable) lead and porosity factors illustrated by Figs. 5 and 10

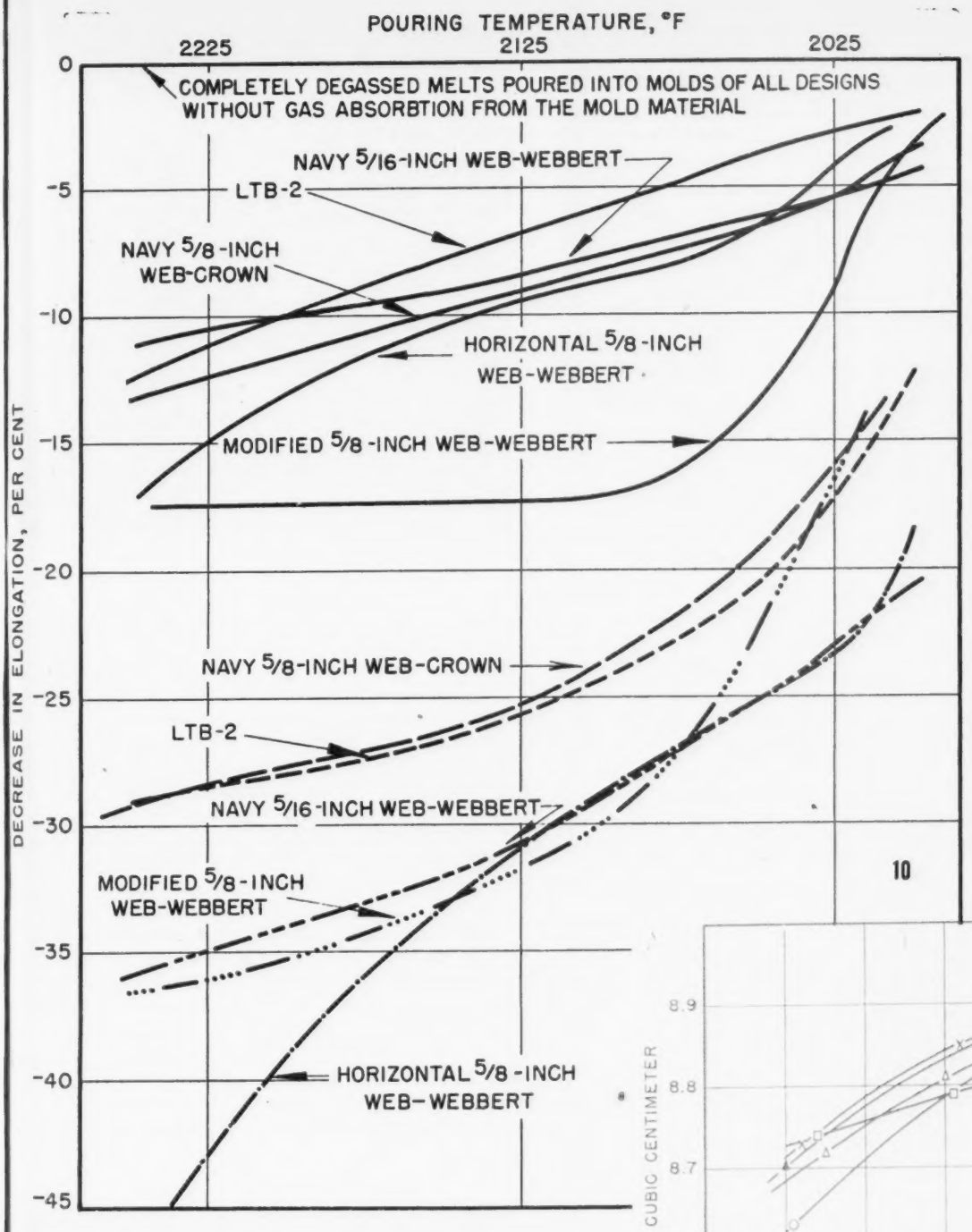


Fig. 10 — Estimated average decrease in elongation produced by microporosity alone in five different test-bar designs poured from high-quality melts (full lines) and poor-quality melts (broken lines) over the temperature range indicated

ed lead particles which become slightly finer as the pouring temperature is decreased to about 2150°F, but when fine equiaxed grains begin to be formed at pouring temperatures near 2100°F, the lead particles become more angular.

In general, as the solidification rate of the test sec-

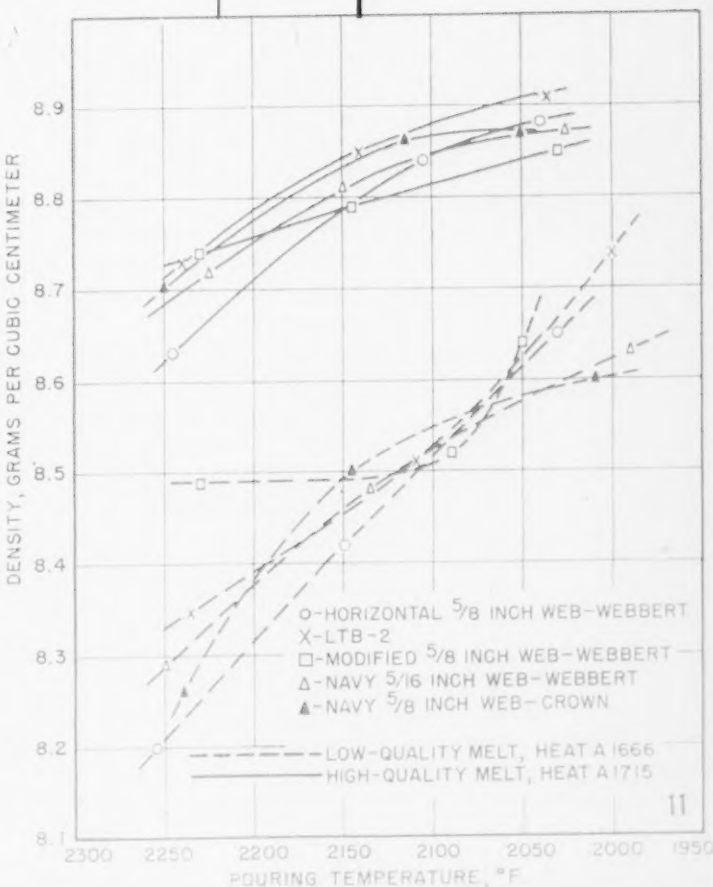


Fig. 11—Effect of test-bar design on density of 85-5-5-5 alloy poured in natural green sand molds from a melt of high quality and one of low quality

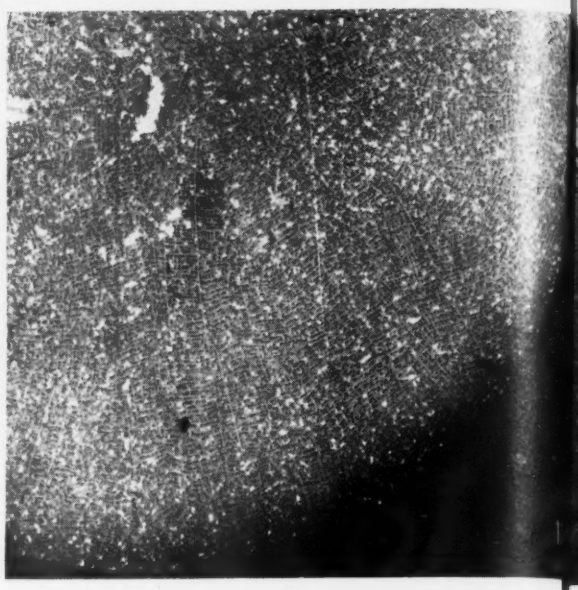
tion decreases from that in the cast-to-shape designs such as the L.T.B. to that in the Modified 5/8-in. web-Webbert, the rounded lead particles tend to increase substantially in size. However, as previously indicated, when the solidification rate is decreased still further—to that in the Navy keel block, for example—the lead particles are angular even at high pouring temperatures. At low pouring temperatures, when relatively fine equiaxed grains are formed, all designs produce angular lead particles and, therefore, all designs appear similar in this respect. Furthermore, the size and shape of the lead particles appear to be substantially independent of the gas content of the melt and dependent only upon the pouring temperature and the solidification rate, as described above. Thus, there are two separate variations in the lead particle size and shape, as follows:

1. The lead particles become angular, a change which is produced in all test-bar designs, except heavy sections, when the pouring temperature is decreased to a value near 2050°F or lower, at which equiaxed grains are formed. However, heavy sections, such as the keel block, produce angular lead particles at all normal pouring temperatures.

2. The rounded lead particles become smaller, a change primarily produced by increasing the solidification rate. Rounded lead particles occur when the pouring temperature is sufficiently high to produce coarse or columnar grains. They become smaller as the solidification rate is increased by changing the design from the Modified 5/8-in. web-Webbert to the L.T.B. In general, of the test bars investigated, the L.T.B. forms the finest rounded lead particles, with the Navy 5/8-in. web-Crown and the Navy 5/16-in. web-Webbert producing lead particles of very nearly the same size as those in the L.T.B. The next coarsest rounded lead particle is formed in the Horizontal 5/8-in. web-Webbert, and of the six different designs investigated in detail, the coarsest rounded lead particle is formed in the Modified 5/8-in. web-Webbert bar. However, if the design is changed to one of still slower solidification rate, such as in the Navy keel block, the lead particles do not tend to be rounded at all, but, on the contrary, are angular at all ordinary pouring temperatures.

In conformity with metallurgical principles well established on other metals, the change in the lead particles from a rounded shape to an angular one produces an adverse effect upon tensile properties. In further conformance with the known effects of such a structural change, the angular lead particles have a greater adverse effect on elongation than upon tensile strength. This effect of the angular lead on the tensile properties is entirely within expectations.

There is also considerable evidence that, as the rounded lead particle size increases, the lead has a less adverse effect on the tensile properties. In other words, coarse, rounded lead particles appear to be more conducive to high elongation values than finer, rounded lead particles. This effect of the size of the rounded lead particle is not so firmly established as the effect of the angular lead particles noted above. Examination of a large number of specimens of 85-5-5-5 alloy has indicated (*Please turn to page* 226)

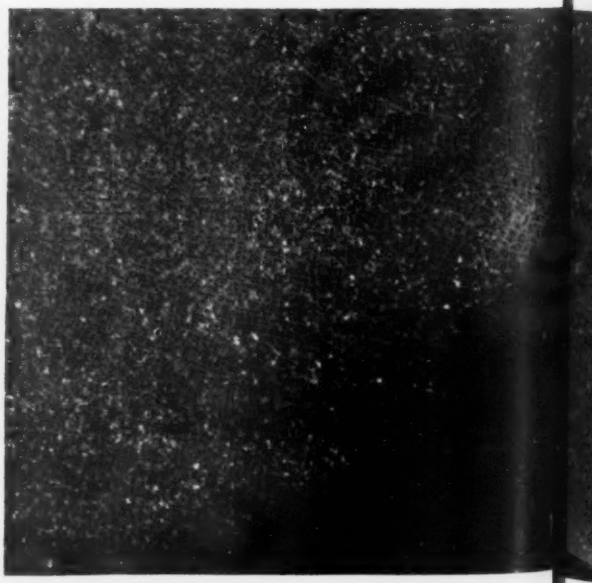


Figs. 12-18—All microradiographs at 15 diameters; one-quarter sections shown here. Alloy is 85-5-5-5

Fig. 12—Heat No. A-1193. Test bar design: L.T.B.-1 with 5-in. open riser. Pouring temperature 2250°F. Tensile strength 38,400 psi; elongation 40.2% in 2 in. Fracture rating: Columnar, small amount of fines, coppery areas. Location of section: Adjacent to the fracture and 2½ in. from the shoulder at the gate end of the test bar

Fig. 13—Heat No. A-1193. Test-bar design: L.T.B.-1 with 3½-in. blind riser. Pouring temperature 2240°F. Tensile strength 34,700 psi; elongation 23% in 2 in. Fracture rating: Small amount of generally distributed coppery areas with a columnar fracture and localized shrinkage at the center

Fig. 14—Heat No. A-1721. Test-bar design: L.T.B.-2 with 5-in. open riser. Pouring temperature 2050°F. Tensile strength 35,300 psi; elongation 23.6% in 2 in. Fracture rating: Small amount of coppery areas with larger coppery areas indicating shrinkage. Location of section: At the fracture and 1½ in. from test bar shoulder at casting's gate end



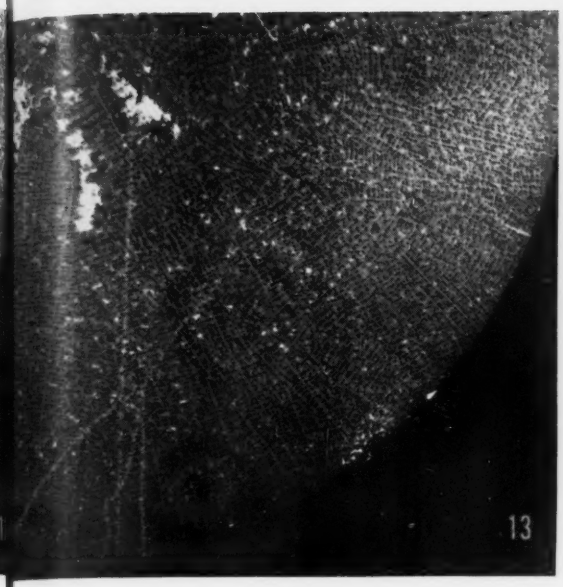
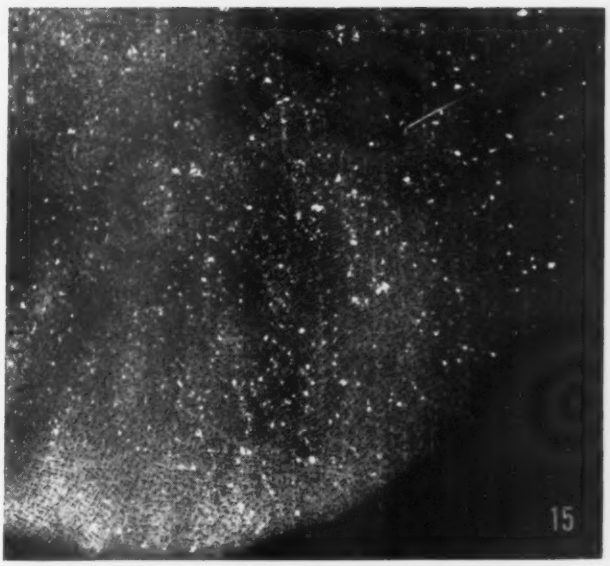


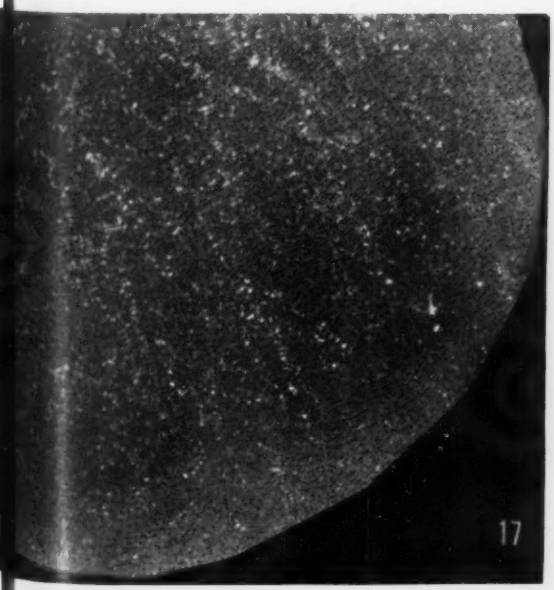
Fig. 15—Heat No. A-1715. Test-bar design: L.T.B.-2 with 5-in. open riser. Pouring temperature 2240°F. Tensile strength 39,200 psi; elongation 43.2% in 2 in. Fracture rating: Columnar, very small amount of fine, coppery areas

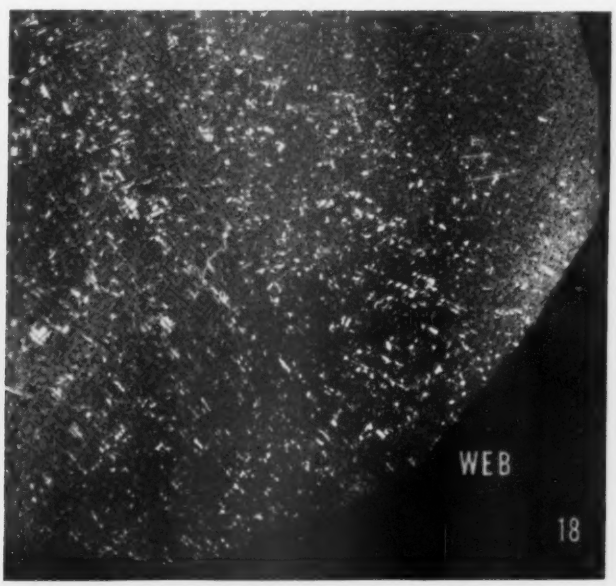
Fig. 16—Heat No. A-1715. Test-bar design: Navy ⅝-in. web-Crown. Pouring temperature 2250°F. Tensile strength 37,800 psi; elongation 33.8% in 2 in. Fracture rating: Very small amount of generally distributed coppery areas. Location of section: At fracture 3 in. from shoulder at test bar gate end

Fig. 17—Heat No. A-1715. Test-bar design: Navy 5/16-in. web-Webbert. Pouring temperature 2225°F. Tensile strength 37,700 psi; elongation 40.6% in 2 in. Fracture rating: Very small amount of fine, coppery areas visible. Location of section: At fracture 3¼ in. from shoulder at gate end of test bar

Fig. 18—Heat No. A-1715. Test-bar design: Horizontal ⅝-in. web-Webbert. Pouring temperature 2245°F. Tensile strength 36,600 psi; elongation 36.8% in 2 in. Fracture rating: Very small amount of fine, coppery areas visible







QUESTIONS and

Must Gate into Heavy Section

Q.—We have experienced a high scrap loss on the bracket casting submitted for your examination, and would like your opinion as to the cause of the defect. Analysis shows 2.43 per cent Si, 0.099 per cent S, 0.253 per cent P, 0.59 per cent Mn, and 3.38 per cent TC. We have had similar losses with irons containing 2.00 to 2.43 per cent Si, and 3.38 to 3.62 per cent TC with carbon equivalent varying from 4.11 to 4.26. Facing sand used has a green strength of 7.5 to 9.0 psi, permeability of 25 to 30, and moisture 6.0 to 8.0 per cent. Sand is natural bond. On all castings the defect has appeared in the same place, varying from a small hole on the surface opening into a larger cavity to the large hole in the present specimen. Defect is on cope side, and does not appear to be a blow.

A.—The defect is a shrink hole resulting from lack of feed during solidification. Your present gates lead into the thinner section which freezes considerably earlier than the heavier section, and cuts off the supply of molten metal to that part. Shifting the gate so that the metal flows into the heavy section should correct the trouble.

As you have observed the analysis of the iron used has no bearing on the defect, and the same applies to the facing sand. However, in case of the latter we believe it advisable to hold the moisture on the low side of the range given to keep steam generation at the minimum.

Core Is Penetrated by Metal

Q.—We are forwarding a piece of a 3¾-in.-diam core showing excessive penetration of metal. This was located in the bottom section of a large gray iron casting weighing about 18,000 lb. Main body core is regular oil-sand, and this core, one of two, forms a leg extending down to the bottom of the casting. Total casting depth is 38 in.; leg cores are 26 in. long and the sprue height with pouring basin is 44 in. Regular oil-sand cores heavily coated with graphite wash and wrapped in three layers of asbestos cloth resulted in very bad penetration so we tried zircon sand in the specimen submitted. Mix was composed of 100 lb zircon sand, 129 fineness; 50 lb zircon flour; 1 qt cereal binder; 2½ qt core oil. Permeability of the baked core was zero, the tensile strength 224 psi, and the scratch hardness 100. Pouring temperature of the iron was 2540°F, and the cores in question are surrounded by 12 in. of metal.

A.—In our opinion the difficulty in removing the core was due to the fact that it is too rigid. Under a magnifying glass the fractured interior surface of the core exhibits shiny particles which appear to be metal, but the exterior surface is smooth—showing no signs of whiskers, fins, veins, etc., usually associated with penetration due to early core disintegration. Your description of the zircon-sand core indicates that it practically was a solid chunk with practically no "give", and after the iron solidified it gripped the core so tightly that it was extremely hard to remove. We believe that if the interior of the core, except for a ½-in. or so shell of zircon sand, had been made of an open sand, no difficulty would have been encountered.

Possibly the zircon sand core was not baked thoroughly in the first place since it is reported that it takes longer to bake than silica sand cores. Also it appears that you are using an excessive amount of core oil in the mixture you describe. Zircon sands do not require any more oil for binding than do silica sands, and core oil and sand preferably should be proportioned by weight. A quart of core oil weighs about 1.95 lb, and you are using 3.25 per cent where 1 or 1.5 per cent will serve.

It might be pointed out that difficulty with penetration in regular sand cores increases with ferrostatic pressure as Gertsman and others have pointed out, and it is essential that the core surface be as impermeable as possible. We believe you are on the right track by using a fine sand with addition of a still finer material—flour—and employing a material which has a low thermal expansion. Gertsman in his investigations indicated that silica sand mixes (about 60 fineness) with 50 per cent silica flour showed less penetration with high ferrostatic heads than without flour.

As pointed out earlier, if the central portion of the zircon-sand core is made with a collapsible sand, or perhaps made with an opening, it could be removed without difficulty. Instead of making a solid core you could use a perforated steel pipe around which could be placed a ½-in. layer of the zircon sand mix. In fact you could use a steel pipe of the desired diameter rammed full of molding sand instead of a sand core.

Solidification Rates Differ

Q.—Some time ago we saw a reference including the claim that the convoluted or corrugated surface of a certain type of casting eliminated the occurrence of shrink cracks and checks which were encountered in use of the solid rib. In other words the solid rib carriers resulted in unequal sections since the ribs were heavy and the body of the casting light. Statement was made that the light part of the casting would cool quickly and the rib or heavier part would remain hot causing cracks. Is that correct?

A.—It is well known that variations in section thickness result in nonuniform solidification rates and tend to set up internal strains which may result in shrink-

answers

age and cracking. Hence, in the case you mention of heavy ribs adjoining thin sections, the latter would freeze first and tend to draw away from the slower freezing ribs. Usually where such conditions exist the foundryman applies chills to the heavier sections so that their freezing rate will approximate that of the thinner sections.

With a uniform section such as would be the case of the corrugated shape or form (to provide the necessary stiffness to the structure), the freezing or solidification rate would be uniform throughout. However, there may be other molding problems connected with making a corrugated section which only could be determined by trying to make the particular casting.

Material Handled per 100 Tons

Q.—Recently we saw a statement to the effect that probably no industry of heavy production compares with the foundry business in the tonnage of materials handled for the tonnage produced in castings. Have you figures that may be used either in support or in contradiction of this statement?

A.—Several years ago FOUNDRY presented a comprehensive report on this subject, written by the chief engineer of a prominent midwest foundry. The author showed that the following weights of materials and equipment are handled daily in a foundry producing 100 tons of cleaned castings: Metals 2606 tons; coke and limestone 95 tons; core materials 1278 tons; molding sand 7491 tons; equipment 5150 tons; miscellaneous 200 tons; total 16,820 tons or 168 tons per ton of castings.

Small Castings Show a Shift

Q.—We are having trouble with small doorknob castings made from a matchplate in a 13 x 17-in. snap flask. We are unable to get two molds exactly alike. In one mold one outside row of castings will show a shift. In a second mold both outside rows of castings will be shifted. In all instances the remaining castings are perfect. We have hand-rammed some molds and squeezed others. We have made two matchplates, one flat and the other crowned, but the results are the same. Flask pins are straight and there is no play in the plate or flask pins and guides. Could it be that the mold is too large and therefore inclined to sag?

A.—Several factors which might affect the job have not been touched upon in your inquiry. Probably the fault may be traced to an ill fitting jacket, or to the fact that no jacket is employed to reinforce the body of sand after the snap flask has been removed. If the outside rows of castings approach the sides of the mold closely, the pressure of the molten iron will force the sand more or less out of shape if it is not reinforced by a close fitting jacket or band. To determine this point we suggest you make a mold and pour it full of metal without removing the snap flask. If the castings produced in that manner are perfect it will be evident that the molds need support. Small flasks are more satisfactory than snap flasks, but if you wish to continue using the snap flask you will have to place a band inside the flask before it is filled with sand. This will prevent distortion. Close fitting jackets answer the same purpose.

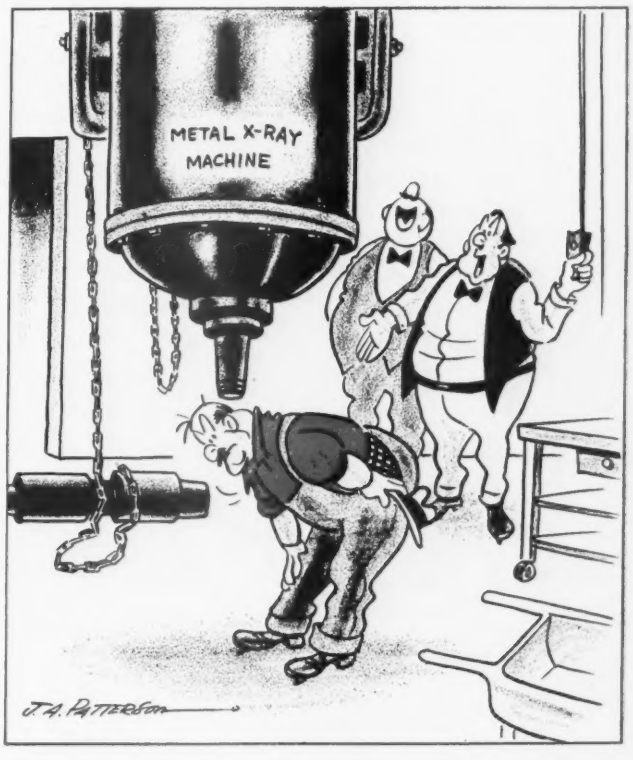
Thin Sections Hard To Drill

Q.—We are having trouble with some thin-section castings we are making in gray iron as they become so hard we cannot drill them. Our mixture is built up to take care of our general run of castings, but from time to time we have a few with thin section. Could you suggest any material we could add to the ladle which would enable us to produce satisfactory castings without changing the mixture?

A.—Your difficulty can be overcome by addition of ferrosilicon or other graphitizing agents to the ladle. A number of the latter are sold under various trade names. The amount of the agent to be added will depend largely on the silicon content of the iron to

GANGWAY!

By J. A. PATTERSON



"Better see a doctor about your headaches, Yardley—I don't think this will work on anything harder than metal!"

QUESTIONS *and Answers*

be "softened." For example, if it presently contains 2 per cent Si, and the section is such that the Si content should be 2.50 per cent, then 0.50 per cent would have to be added. If 80 per cent ferrosilicon is used, about 0.6 lb or 10 oz would be added to 100 lb of the iron. Amount of the other materials or agents would be determined in a similar manner according to the manufacturer's directions. Silicon should be in ground form so that it will dissolve easily, and the iron should be hot.

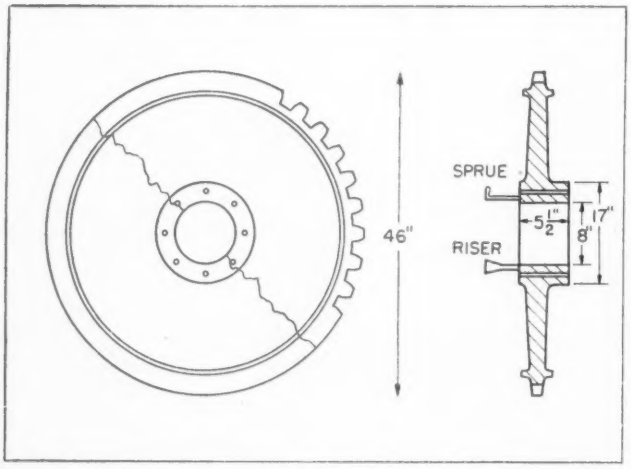
Wheel Cracks Through Center

Q.—A gray iron sprocket wheel 46 in. diam, web center 1⅜ in. thick, hub 17 in. OD, 8½ in. ID, left in the sand over night, cracked all the way across the center after eight 1½ in. holes had been drilled through the hub on a 14 in. diam bolt circle. The metal was poured into the mold through a single sprue 1¼ in. diam on the hub, and was fed through a 2-in. riser, upper part enlarged to 4 in. on the hub diametrically opposite the sprue. Analysis of the metal showed Si 1.96, S 0.116, P 0.53, Mn 0.41, TC 3.05. In the future we propose to change the analysis to Si 2.10, Ni 1.20, S 0.116, Mo 0.50, P 0.30, Cr 0.25, Mn 0.45, TC 2.90. We shall appreciate your comment on the gating system, the present analysis and the proposed analysis.

A.—The proposed analysis of an alloyed iron will produce a stronger wheel, a wheel that will give long and satisfactory service, but it will not prevent the casting from cracking unless suitable measures are taken to equalize the cooling rate of the various areas after the metal has solidified in the mold. Except under severe operating conditions, any grade of ordinary gray iron might be poured into one of these sprocket wheel castings.

Your problem is not one of composition, but of the immutable laws of expansion and contraction. Some irons adapt themselves better than others to the strains set up in cooling. In this particular instance your present iron would be improved by increasing the Si content to 2.10, the Mn to 0.70, and reducing the sulphur to 0.10. However, that is only an incidental feature. The wheel rim cools first and is prevented from contracting normally by the central web and the hub. Therefore, it remains in tension. Later the web and then the hub start to pull and thus increase the tension. The shock of boring the bolt holes in the hub is what you might call the last straw. The casting splits.

It is not uncommon for a large, flat circular casting with heavy center to crack before it leaves the mold. The usual foundry remedy in cases similar to yours is to cool the hub as rapidly as possible. Leave the cope in place, but dig down to uncover the hub, and dig out the center core. Your gating system conforms to usual foundry practice.



Sprocket wheel cracked when partly machined

Cupola Melting Loss Too High

Q.—We are operating a 36-in. ID cupola, and are having trouble with a 15 per cent melting loss as well as a lowering of the bed. Iron comes down very hot, but we are afraid to reduce coke between charges on account of the bed burning out too much as it is. Present heats average 1 to 2 hr, but we are contemplating operation for 3 to 4 hr. We do not use flux, but the slag is very fluid. Charging door is 9 ft 4 in. above the tops of the tuyeres which are 3½ x 13 in. Coke bed extends 28 in. above tops of tuyeres. Fan blower operates 2450 rpm. Iron charge is 800 lb and coke splits 120 lb. We are using all scrap; first three all iron, and remainder contain 40 to 50 per cent steel scrap.

A.—An all-scrap charge will show a higher melting loss than one containing some pig iron, and normally with the latter the melting loss will be from 3 to 5 per cent. Consequently, your 15 per cent loss is excessive and might be due to rusty or dirty scrap, or from heavy oxidation within the cupola. Your present height of cupola from charging doors to tuyeres is quite short, and coke efficiency will be low. A more satisfactory height would be 12 to 15 ft. Your tuyeres, 3½ x 13 in., are slightly small for a 36-in. cupola (18 per cent of cross-sectional area) and it would be better to make them 5 x 13 in. Additional area would permit adjustment of individual tuyeres to correct for localized burn-out if that should occur.

Your present blower appears to have insufficient capacity to permit the cupola to operate at its rating of 4 to 5 tons per hr. At a coke-to-iron ratio of 1:7 the air supply should be 2100 to 2800 cfm, and at your present melting rate of 3 tons per hr, the indications are that the fan is delivering only 1500 to 1600 cfm. Air delivery from fans is largely dependent on back pressure, and before making any changes in speed, it is advisable to check with the manufacturer giving information on amount of air required and probable operating pressure, since both will be needed to supply suitable recommendations. Although,

(*Concluded on page* 130)

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Proper sand conditioning is a major step in the improvement of casting quality. Castings made with molding sand that has been thoroughly separated and blended require less machining and cleaning time. You will have fewer rejects due to blows, skids and runouts . . . surface inclusions and rough surfaces are largely eliminated.

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QUESTIONS *and Answers*

(*Concluded from page* 128)

as previously mentioned, it would be helpful to raise the stack height, it is doubtful that the present blower would deliver sufficient air due to increase in back pressure.

To us your present bed height is much too low, and we suggest that it be raised to 45 in. above the tuyeres. Put in about 80 per cent of the bed, ignite it, and allow it to burn until it is cherry red all over. Then add the remainder of the coke to bring it to the proper height. After observing the results for a few days, you may be able to reduce the height to some extent—a few inches at a time—but probably to not less than 40 in. Your present iron-coke ratio is about 7:1 which normally should be all right, but with the short stack height, high steel and scrap charge, more coke may be required. However, try the higher bed first for a few days and watch the results. If the performance is not satisfactory increase the coke charge at a rate of 5 lb. If the increased coke causes a drop in melting rate, it indicates that the blower does not have sufficient capacity.

A normal iron charge requires limestone flux of about 3 to 4 per cent of the weight of iron, but an all-scrap charge will need more to give proper fluidity, and it may be necessary to use 35 to 40 lb per charge. If you are contemplating heats of 3 to 4 hr, the cupola should be slagged. Slag hole should be located about 3 in. below the bottoms of the tuyeres, and one 1½ in. in diam should be satisfactory. If the slag hole is installed it should be remembered that it will reduce the capacity of the present well, and the tapping schedule should be adjusted accordingly.

Wants To Increase the Carbon

Q.—In our foundry in Australia we are using pig iron with a total carbon content of 2.9 to 3.0 per cent since we cannot obtain the desired 3.3 to 3.6 per cent total carbon type, and we would like to know how we can insure the desired carbon pickup in oil-fired crucible furnaces and a 200-kva direct-arc electric furnace. Also in event a cupola is installed what method could be used? Our castings are light, averaging about 10 lb, comprising high quality castings for refrigerators and general industrial uses including pressure-tight castings. We also make our own centrifugal castings for piston rings and cylinder liners. We have a laboratory and metallurgist, and work to close specifications for our various mixes.

A.—Carbon absorption or pickup essentially is a time-temperature relationship. The longer the iron is in contact with the carbon the greater the pickup, and likewise the higher the temperature the greater the absorption. In the case of the oil-fired crucible furnaces, addition of carbon in fairly coarse form such as graphite in lump or block form, petroleum coke, pitch coke, electrode stubs, hard coal, etc., in the bottom of the crucible will provide some carbon pickup and the longer the iron remains in contact with the carbonaceous material, the greater the pickup. Just how much can be absorbed will have to be determined by experiment. Carbon pickup may be higher if the carbonaceous material is stirred or rabbled into the molten iron bath.

In the case of the electric furnace, carbon pickup may be obtained in the same manner—placing the carbonaceous material on the bottom of the furnace and covering it with the iron charge. Dipping or immersing the electrodes in the molten bath also would provide carbon pickup. Here again you would have to experiment to determine the most suitable procedure to obtain the desired carbon content in the final iron.

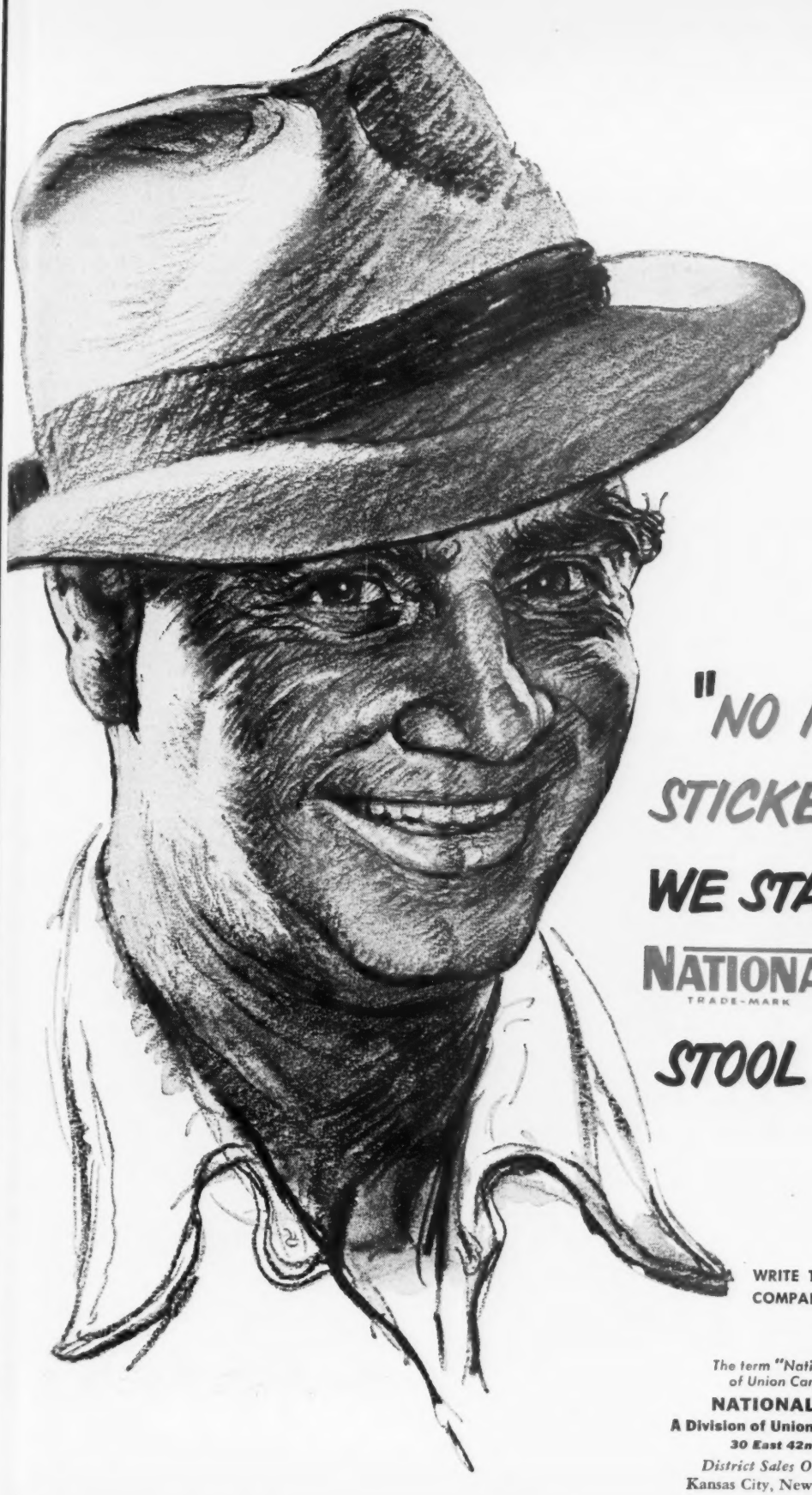
Carbon pickup in cupolas is obtained by use of some petroleum coke, pitch coke, graphite in lump or briquet form in the coke splits between charges. In some cases graphite such as lumps, briquets, or electrode stubs is placed in the bed coke. Arranging the tapping time or rate of the cupola so that the metal remains in contact with the coke for the longest possible time increases carbon pickup.

Metal Pressure on Core Is High

Q.—We are making a gray iron machine tool bed weighing 20,000 lb, and are having considerable trouble with metal penetration in a central core surrounded by 11 in. of metal. Main body of the core is 42 in. long, 22 in. deep, and 6 in. wide. It has three cylindrical projections or legs 11 in. long, two of which are 3 in. in diam and the other 4 in. in diam. Legs of the core touch bottom of mold. Core mixture is composed of 400 lb lake sand, 400 lb bank sand, 90 lb silica flour, 5½ lb corn flour, and 4 qt core oil. We have tried wrapping the core in asbestos paper without any improvement. Penetration begins about 8 in. from top of core, and gets progressively worse toward the bottom.

A.—Since increasing pressure or ferrostatic head increases the tendency of metal to penetrate cores, it is somewhat difficult to formulate the core mixes which will stand up under all conditions. Essential procedure is to provide a surface which is as impermeable as possible to entry of the metal, and in some instances this can be accomplished by use of refractory core washes. Another method is to make the core of two different types of sand—an outside layer or facing of fine sand or a combination of sands to produce a low pore space, and an interior of open, permeable sand. In some cases a combination of two—that is, a faced core coated with a wash—may be used.

You might try a core faced with ½-in. of a mixture composed of 500 lb silica sand, 500 lb silica flour, 10 lb bentonite and 1½ gal of core oil. Center of the core is composed of your regular core sand mix. Possibly your present core mixture collapses too readily. That could be corrected by the addition of a small amount of bentonite or clay, or iron oxide.



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MEN

of Industry

LEROY E. ROARK has resigned as executive vice president, National Foundry Association, to accept an appointment with the Economic Co-operation Administration. Mr. Roark, who was named executive head of the National Foundry Association in 1945, will remain active in the industry since his ECA assignment will involve development of the foundry industry in countries of Western Europe. **Edward J. Walsh,** as acting secretary, will direct operations of the NFA national office, Chicago. **Charles E. Seaman,** for nine years New York representative for NFA, now is in Paris with the Office of the Special Representative for ECA. His work involves technical assistance to foundries of France and the Netherlands. **George P. Fisher,** formerly vice president of the Whiting Corp., Harvey, Ill., also has joined ECA, heading a team of foundrymen who will work in Italy, France and the Netherlands.

♦ ♦ ♦

Thomas G. McNamara has been appointed chief metallurgist, Alloy Engineering & Casting Co., Champaign, Ill., research and development engineers. For the past 5½ years Mr. McNamara has been chief metallurgist, Continental Aviation & Engineering Corp., Detroit. Mr. McNamara, who attended Michigan State Normal College and the graduate school of Wayne University, was previously associated with Continental Motors Corp., Detroit, for 3½ years.

♦ ♦ ♦

Dr. Raymond C. Machler, formerly associate director of research, has been appointed director of research, Leeds & Northrup Co., Philadelphia, succeeding **I. Melville Stein** who has become executive vice president. Dr. Machler, a graduate of Northwestern University, joined Leeds & Northrup as a research engineer in 1929. **G. A. Perley** and **A. J. Williams Jr.,** formerly assistants to the director in the research department, have joined **J. C. Peters** as associate research directors.

♦ ♦ ♦

William A. Spence has been appointed general manager of Ohio Hoist & Mfg. Co., Cleveland, one of the Round Associate Chain Companies, where he will supervise manufacture and sales distribution of hoists and other material handling equipment. Until recently Mr. Spence was associated with Manning, Maxwell & Moore Inc., Muskegon, Mich., the last 5 years as a field engineer.

♦ ♦ ♦

W. Cordes Snyder Jr., since 1949 vice president and manager of the metallurgical department, Koppers Co., Pittsburgh, has been elected president and chief executive officer, Blaw-Knox Co., Pittsburgh, effective Nov. 1, succeeding **William P. Witherow,** who has been named chairman of the board. Mr. Snyder previously was a vice president of Blaw-Knox, in charge of its Lewis Foundry & Machine Division. **Chester H. Lehman** continues as vice chairman of the board and executive vice president of Blaw-Knox.

♦ ♦ ♦

Harry Oldham has been named consultant for the foundries of Hunt-Spiller Mfg. Corp., Boston. **William E. Mulcahy** succeeds Mr. Oldham as superintendent of foundries.

♦ ♦ ♦

Howard J. Moore has been named plant engineer, **Russell Brant,** assistant metallurgist and **John W. MacMillan,** superintendent, Engineering Castings Inc., Marshall, Mich. Mr. Moore, a graduate of Tri-State College, was formerly a draftsman and engineer, Kellogg Co., Battle Creek, Mich. Mr. Brant, who was graduated from Michigan State College in June, has been assigned to the quality control and technical departments for

(*Continued on page* 134)

LEROY E. ROARK
. . . joins ECA

THOMAS G. McNAMARA
. . . chief metallurgist

DR. RAYMOND C. MACHLER
. . . research, Leeds & Northrup

WILLIAM A. SPENCE
. . . gen. mgr., Ohio Hoist

Increase Customer Satisfaction

with APEX Products

- **ALUMINUM ALLOYS** — *for all types of castings*
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In the Apex laboratories, Apex research and facilities are devoted to producing *better* ingot, analyzing particular problems for foundries who use *all* methods of castings—sand, permanent mold or die casting. Thus, Apex maintains always this high standard: "Best in every test from Ingot to Casting!"

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MEN *of Industry*

(*Continued from page* 132)

engineering castings. Mr. MacMillan, who was graduated from University of Michigan, for the past 3 years has been a foundry engineer, Ingersoll-Rand Corp., Painted Post, N. Y.

♦ ♦ ♦

Walter W. Moore, recently elected president of the Chicago Chapter of the AFS for 1951-52, is works manager, Burnside Steel Foundry Co., Chicago. Mr. Moore was graduated from Wilmington College and spent 5 years with Farrell-Cheek Steel Co., Sandusky, O., prior to joining Burnside Steel Foundry in 1934. He served in the timestudy and methods department and as general molding foreman and superintendent there until 1948 when he became works manager. He became a director of the Chicago Chapter in 1949 and was vice president last year.

♦ ♦ ♦

W. E. Madden, formerly vice president, George Haiss Mfg. Co., New York, has been appointed director of sales of those Pettibone Mulliken companies whose products are sold to the construction, road building, processing and materials handling fields. **J. M. Hume,** formerly sales manager, Universal Engineering Corp., Cedar Rapids, Iowa, has been named assistant director of sales. Both will make their headquarters at the company's home office in Chicago. This new sales setup in no way affects the Railway Track Materials Division or the Beardsley & Piper Division of the company.

♦ ♦ ♦

Porter Warner Jr., recently elected chairman of the Tennessee Chapter of the AFS, is vice president, Porter Warner Industries, Chattanooga, Tenn., producers, importers and distributors of foundry materials and industrial minerals. Mr. Warner attended University of Virginia, during the summers working in the pattern shop of Lucey Mfg. Corp., Chattanooga, maker of oil drilling machinery. He was engaged in banking and newspaper work from 1926 until 1939, when he joined his father's company which specialized in molding sand and foundry supplies. Mr. Warner was vice chairman of the Tennessee Chapter last year.

♦ ♦ ♦

Carl C. Kleinschmidt has been appointed assistant general manager of Williams & Co. Inc., Pittsburgh. **M. C. Young** succeeds him as manager of the aluminum, brass and copper department. **E. A. Miller** succeeds Mr. Young as manager of the accessory department.

♦ ♦ ♦

Fred Carl, research engineer, Allison Division of GMC, Bedford, Ind., has been appointed chairman of the Purdue University Advisory Committee, Foundry Educational Foundation, succeeding **Paul Harlan,** vice president, Electric Steel Castings Co., Iindianapolis. Mr. Carl has been a member of the advisory committee since its inception in 1949. Under leadership of Mr. Harlan the committee has co-operated closely with the college in development of the laboratory and additional course facilities available to students under the sponsorship of the FEF.

♦ ♦ ♦

Warren Rambo has been named maintenance superintendent of the Danville, Ill., plant, Central Foundry Division, General Motors Corp., following three years in that capacity at the Defiance, O., plant. **Robert Page,** general foreman of the Defiance plant coreroom, has succeeded Mr. Rambo as superintendent there. **Frank Camp,** formerly inspection general foreman at Danville, has been transferred to Defiance as second shift coreroom general foreman, replacing Mr. Page. **Robert Newtson,** formerly general superintendent of accounting at Danville, has been named resident comptroller at Defiance, succeeding **Tyler H. Barrett,** recently transferred to the division office at Saginaw, Mich.

♦ ♦ ♦

Ray L. Hampton has been named vice president-sales, Mosebach Electric & Supply Co., Pittsburgh, maker of special brass and bronze castings for industrial use. Mr. Hampton was graduated from University of West Virginia, and prior to joining Mosebach Electric early this year as sales manager, he was manager of Controller Block & Supply Co., Kermit, W. Va., for 3 years. Previous connections include Superior Sterling Co., Bluefield, W. Va., and Duquesne Mine Supply Co., Pittsburgh.

♦ ♦ ♦

Thomas Schrader, Jr., sales manager, Erie City Iron Works, Erie, Pa., was elected a vice president of the firm. He replaces **Dudley Selden,** who has resigned the vice presidency but will continue as a director. Mr. Schrader will continue to have charge of sales for the firm.

♦ ♦ ♦

Dr. Mark E. Putnam has been elected vice president, the Dow Chemical Co., Midland, Mich. Dr. Putnam, who joined the company in 1915, has been a director since 1941 and a vice president since 1942.

♦ ♦ ♦

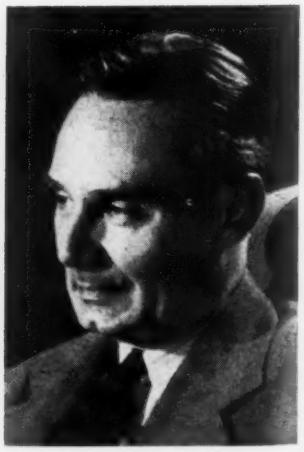
Henning B. Dieter, owner of D & H Foundry, Austin, Tex., has been appointed ferrous industries representative on the Military Security Board for Germany, at Coblenz, a new posi-

(*Continued on page* 137)

WALTER W. MOORE
. . . heads Chicago AFS Chapter

J. M. HUME
. . . Pettibone Mulliken sales

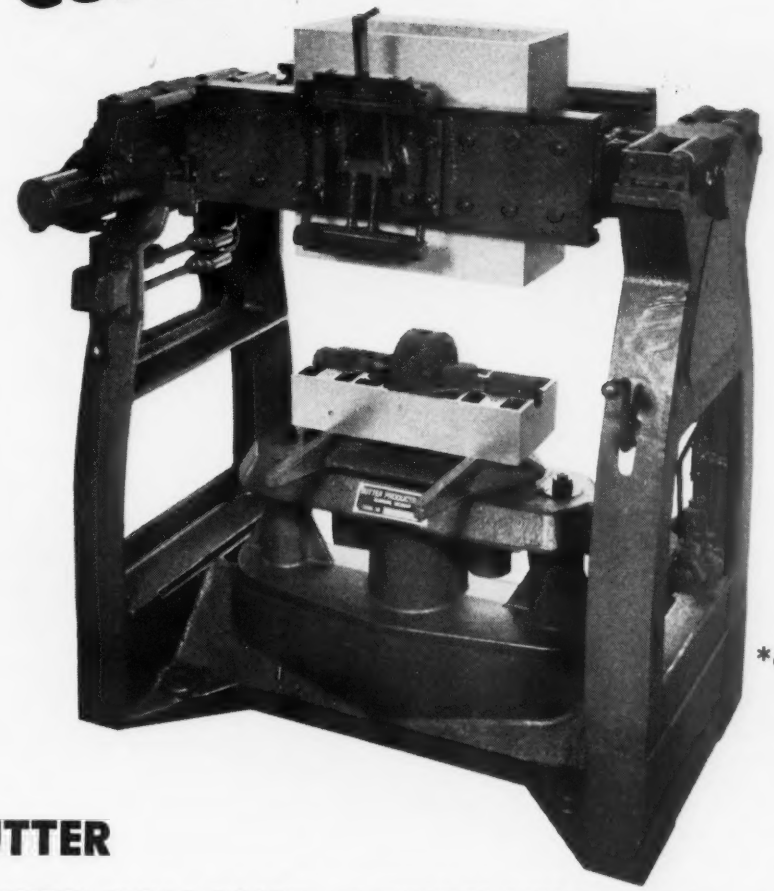
W. E. MADDEN
. . . sales, Pettibone Mulliken



PORTER WARNER JR.
. . . Tennessee Chapter Chairman

Cores drawn automatically*

300% faster



*even with unskilled labor

SUTTER

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The Sutter Core Draw Machine is completely automatic. The operator needs only to push the start button and remove the drawn cores from the table. Since this automatic cycle takes only six seconds—from clamping of the dryer until the drawn core rests on the table—production is increased 300% to 400%. At the same time, because every core is drawn automatically and *uniformly*, even unskilled operators can maintain peak output of the most complicated cores.

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Sutter Automatic Core Draw Machines are in use in a number of leading U.S. foundries. If you are interested in seeing one in operation, we will gladly arrange for you to visit the nearest one in your locality.

The Sutter Core Draw Machine is equipped with a double rollover frame so that the operator can blow one core while another is being drawn. Power-rollover and draw have speed control for regulation to any production cycle. Thus, these versatile machines may be used with an automatic core blower—on either or both sides—where the operator blows and draws cores or in a loop set-up where cores are hand drawn.

Four standard sizes meet the requirements of most foundry applications but specials can be developed for the unusual job. Complete information is contained in Sutter Bulletin "F". Send for it today.

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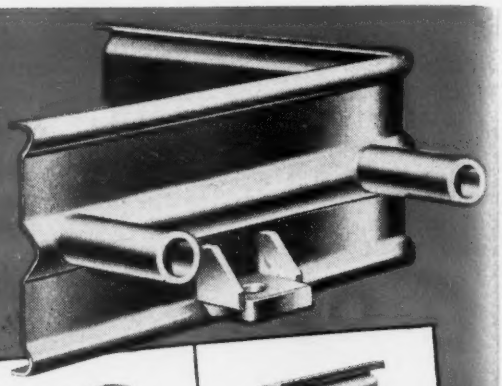
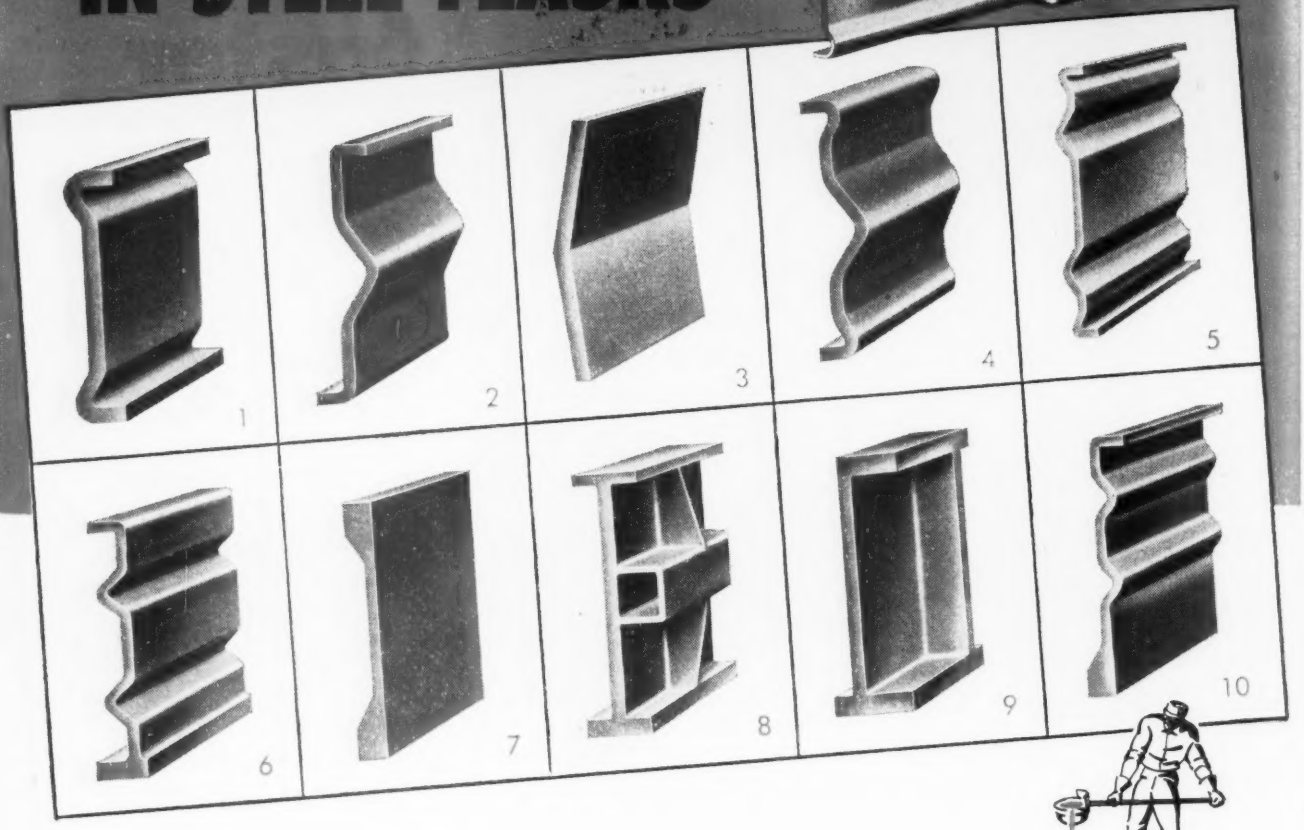
Everything IN STEEL FLASKS





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WILLIAM J. CRAWFORD
. . . Carbon Corp. executive

PHILIP C. RODGER
. . . heads N. California Chapter

DAN CHAPIN
. . . Dow magnesium sales

DAN A. MITCHELL
. . . Tri-State Chapter Chairman

(*Continued from page* 134)
tion created by the State Department for control of steel production in the western zones of Germany. Mr. Dieter, a graduate of the University of Texas, remained in Germany after the close of World War II as assistant economic advisor to the American chairman, Bizonal Control Office.

♦ ♦ ♦

William J. Crawford has been elected president of British-American Carbon Corp., New York, recently formed by Great Lakes Carbon Corp., New York, and Powell Duffryn Carbon Products Ltd., Hayes, Middlesex, England, to produce exclusively carbon and graphite manufactured by the Delanium process developed by Powell Duffryn Carbon Products Ltd. Mr. Crawford was formerly associated with Great Lakes Carbon Corp.

♦ ♦ ♦

Philip C. Rodger, recently elected president of the Northern California Chapter of the AFS for 1951-52, is vice president in charge of the Metals Division, General Metals Corp., Oakland, Calif. Mr. Rodger was born and educated in Oakland and in 1920 joined the Jewell Steel & Malleable Co., there, as a draftsman. In 1928, when it was consolidated with Pacific Malleable Co. and Western Malleable Co., he was made superintendent of the Pacific Malleable Division, General Metals Corp. He later worked in the steel foundry of the corporation, and in 1947 was made plant manager of the malleable, iron, steel and nonferrous foundries. Mr. Rodger was vice president of the Northern California Chapter last year.

♦ ♦ ♦

Dan Chapin has joined the magnesium sales department of the Dow Chemical Co., Midland, Mich., with headquarters in Cleveland. Mr. Chapin, a graduate of Yale University, joined the company last year and has completed the general training course and a supplementary training course in magnesium.

♦ ♦ ♦

Dan A. Mitchell, recently elected chairman of the Tri-State Chapter of the American Foundrymen's Society for 1951-52, is in charge of sales and customer relations, Progressive Brass Mfg. Co., Tulsa, Okla. Mr. Mitchell, who has been associated with the company for 21 years, served his apprenticeship as molder and coremaker there, later becoming coreroom foreman, assistant foundry superintendent, and laboratory analyst. During 1945, on a three-months' leave of absence, he was assistant foundry superintendent in charge of the brass foundry, Star Machine & Foundry Co., Amarillo, Tex. He assumed his present position upon his return to Progressive Brass. Active in the Tri-State Chapter, Mr. Mitchell was secretary for 2 years and vice chairman last year.

♦ ♦ ♦

Dr. James F. Eversole has been appointed manager, research administration, Union Carbide & Carbon Corp., New York, to co-ordinate activities of all of its laboratories. Dr. Eversole joined the chemical research organization in 1929. Several years later he was assigned to the laboratories of Linde Air Products Co., a division of Union Carbide. Since 1944 he has been superintendent of Linde's laboratories in Tonawanda, N. Y.

♦ ♦ ♦

George Medley has joined Alloy Engineering & Casting Co., Champaign, Ill., as assistant to **Walter W. Edens,** associate project director on engineering and development and pilot production activities. Mr. Medley was graduated from State College of Washington where he worked in the Division of Industrial Research. During the past year and a half he has been associated with Boeing Airplane Co., and Stetson - Ross Machine Works, both of Seattle, and more recently as manufacturing engineer, Hughes Aircraft Co., Culver City, Calif., in planning and process development work.

♦ ♦ ♦

Nathan R. Johnson, director and factory manager, Buffalo Forge Co., Buffalo, has retired following 35 years with the company. A graduate of University of Wisconsin, Mr. Johnson joined the company as purchasing agent, and became factory manager in 1945. **William R. Heath** has succeeded Mr. Johnson as manufacturing director. Mr. Heath was graduated from Cornell University and joined the company in 1922. He became chief engineer in 1948. **John E. Gill,** graduate of Worcester Polytechnic Institute, who joined the company in 1929, has been named chief engineer. **George P. Schivley,** graduate of Drexel Institute, who became plant superintendent of Buffalo Forge in 1943, has been named plant manager.

♦ ♦ ♦

Dr. G. Raymond Fitterer, head of University of Pittsburgh department of metallurgical engineering since 1939, has been appointed dean of the Schools of Engineering and Mines.

♦ ♦ ♦

Dr. Harry G. Mitchell, formerly director of product development and advertising, Speer Carbon Co., St. Mary's, Pa., has been recalled to his World War II post as chief of the Carbon Products Section, National Production Authority. **Ives Harvey** will handle Dr. Mitchell's advertising duties while he is on leave from the company.

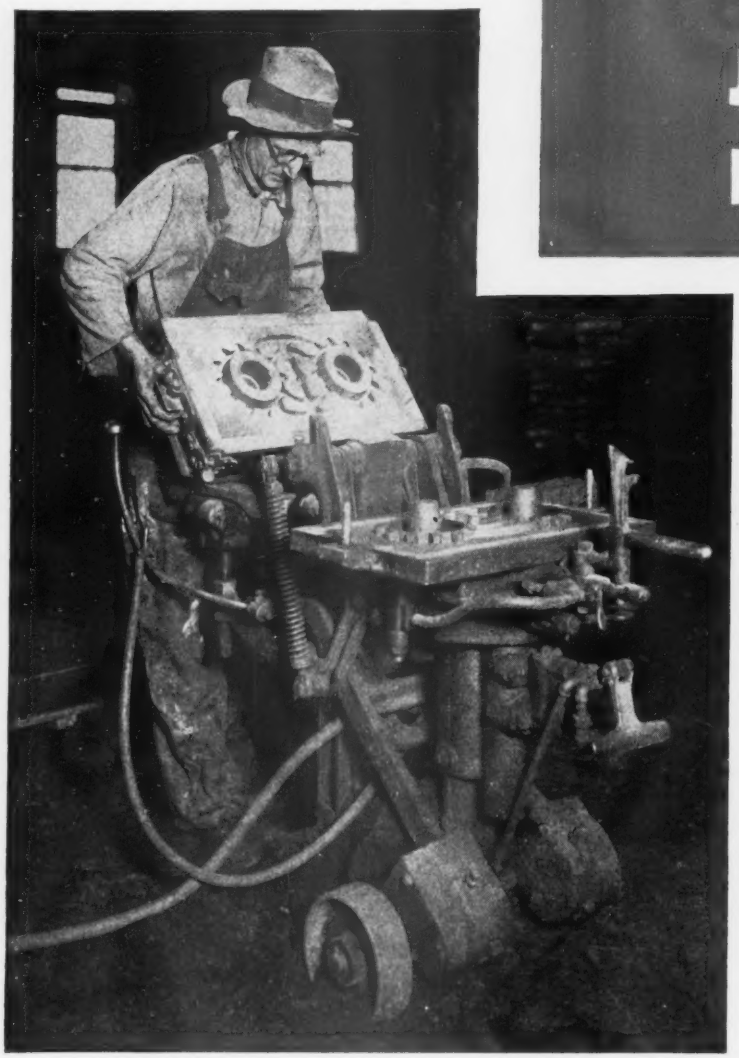
♦ ♦ ♦

A. D. Engle has been appointed assistant vice president for research, the Austin Co., Cleveland. Mr. Engle

(*Continued on page* 140)

INTERNATIONAL TYPE RJ

Jolt Ram · Hand or Foot



TYPE RJ— Jolt Ram, Hand Turnover, Hand or Foot lever Draw Machine, is built in a wide range of sizes from 14" x 8" draw up to 20" x 12" draw.

The overall construction and design of the International RJ makes for convenient operation.

THE RJ MACHINE IS JUST ONE OF THE 90 STANDARD TYPES

INTERNATIONAL MOLDING MACHINE CO.

LA GRANGE, ILLINOIS

J MOLDING MACHINE

hd Turnover
oLever Draw

- Inquiries should specify outside width and length of the largest flask or core box to be handled and amount of draw required.
- The International **TYPE RJ** is designed, as are all of the machines in the line, by experienced foundry engineers who have a practical working knowledge of the problems of the business.
- The RJ is used extensively for cores.

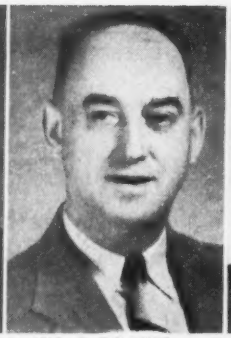
TAND 1400 DIFFERENT SIZES IN THE INTERNATIONAL LINE

DG MACHINE COMPANY

E K, ILLINOIS

J. G. SCHAEFFER

J. W. BEAVIS



W. J. ROGERS

HAROLD BANKS

Lycoming-Spencer Division of Avco Mfg. Corp., Williamsport, Pa., recently made a number of appointments to its foundry staff there. **John G. Schaeffer,** named foundry manager, formerly was assistant foundry manager, Packard Motor Car Co., Detroit, and previously was with Chevrolet-Saginaw Gray Iron Foundry, Saginaw, Mich. **James W. Beavis,** new assistant foundry manager, Lycoming-Spencer, recently was general foundry foreman at Packard and was general foreman of Kelsey-Hayes Wheel Co., Detroit, for over 21 years. **William J. Rogers,** appointed chief metallurgist, was graduated from Michigan College of Mining and Technology. Formerly associated with Bohn Aluminum & Brass Corp. and Ford Motor Co., he was with Packard Motor Car Co. 16 years, as metallurgist and general foreman. **Harold Banks,** named pattern shop superintendent, had been with Packard for 15 years. The new coreroom superintendent is **William Henry,** who spent 5 years with Packard and previously was with Fulton Iron Works Co., St. Louis, and Youngstown Foundry & Machine Co., Youngstown, O. **John Jaecques,** with Packard's engineering division for 13 years, has been appointed plant engineer.

(*Continued from page* 137)

joined the company's engineering staff in 1920 and has been district engineer in Chicago since 1945. **George Miller,** since 1948, the company's co-ordinating engineer on Atomic Energy Commission work at Oak Ridge, has succeeded Mr. Engle in Chicago.

♦ ♦ ♦

G. C. (Jack) Cole has been appointed foundry manager and a director, Wysong & Miles Foundry Inc., subsidiary of Wysong & Miles Co., Greensboro, N. C., maker of sheet metal working machinery, squaring shears and bending rolls. Mr. Cole was formerly associated with National Farm Machinery Co-operative Inc., Bellevue, O.; Forest City Foundries Co., Cleveland; Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich.; Peoria Malleable Castings Co., and Caterpillar Tractor Co., Peoria, Ill.

♦ ♦ ♦

W. T. Shute, elected chairman of the Eastern Canada Chapter of the American Foundrymen's Society for 1951-52, is works manager of the Steel Foundry Division, Canadian Car & Foundry Co. Ltd., Montreal. Mr. Shute, a native of Nova Scotia, moved to Montreal in 1930 and was graduated from McGill University, there. He was chairman of the educational committee for Eastern Canada Chapter for two years and vice chairman last year.

♦ ♦ ♦

Morris G. Milner has joined the Naval Stores sales staff of Hercules Powder Co., Wilmington, Del., where he will handle sale of resin sand binders to the foundry industry. Mr. Milner, who became a member of the company's Chicago office sales organization in 1934, was transferred to the Wilmington home office in 1942 and since 1943 has been in the New York office.

♦ ♦ ♦

A. William Schneble, who has been elected chairman of the Cincinnati District Chapter of the American Foundrymens' Society for 1951-52, is vice president, Advance Foundry Co., Dayton, O. Mr. Schneble was graduated from University of Dayton in 1939 and received his doctor's degree in metallurgical engineering from Massachusetts Institute of Technology in 1941. He was metallurgical engineer for Advance Foundry from 1942 to 1945, when he became plant manager, and was elected vice president in 1947. Mr. Schneble has been a director of Cincinnati Chapter for 5 years and was vice chairman last year.

♦ ♦ ♦

Carl J. Gross has been appointed general manager of a new midwestern department recently established by Federated Metals Division, American Smelting & Refining Co., New York, which will include North and South Dakota, Minnesota, Michigan, Wisconsin, Indiana, parts of Illinois, Ohio, Iowa and Kentucky. Mr. Gross will continue as manager of the Whiting, Ind., plant. **Allan Nichamin** has been appointed manager of the Detroit plant succeeding **Robert Ruch,** resigned. **Waldo C. Larson** continues

(*Concluded on page* 143)

G. C. COLE
. . . joins Wysong & Miles

W. T. SHUTE
. . . heads E. Canada Chapter

MORRIS G. MILNER
. . . Hercules Powder sales

A. WILLIAM SCHNEBLE
. . . Cincinnati Chapter Chairman

MALLEABRASIVE®*

(SHOT AND GRIT)

SAVES $2995.00 a year CLEANING CASTINGS Like These!

Here's the report from Lynchburg Foundry

Lynchburg took advantage of Pangborn's offer to test Malleabrasive in their own shop. They tested it against ordinary shot for three months, and *their own records* prove Malleabrasive saves them $2995.00 a year on blast cleaning. Not only that, but replacement parts cost has been reduced *73.8%*—and abrasive handling has been cut in half!

Malleabrasive is the *original* long-life abrasive pioneered by The Globe Steel Abrasive Co., Mansfield, Ohio. Pangborn invites you to test Malleabrasive as Lynchburg Foundry did. Use it in your own cleaning room and find out exactly how much you can save!

SEND FOR FREE TEST KIT

Contains all the forms you need to run an impartial test. Remember, Malleabrasive is guaranteed to outperform ordinary shot and grit when comparative tests are properly run. For your free kit, write today to: PANGBORN CORPORATION, 1400 Pangborn Blvd., Hagerstown, Md.

Look to Pangborn for the latest developments in Blast Cleaning and Dust Control Equipment

These savings are possible because MALLEABRASIVE

- *is designed for modern cleaning equipment*
- *wears out fewer machine parts*
- *lasts 2 to 4 times longer*
- *reduces machine down-time*
- *reduces cleaning costs up to 50%*
- *increases output of cleaned castings*

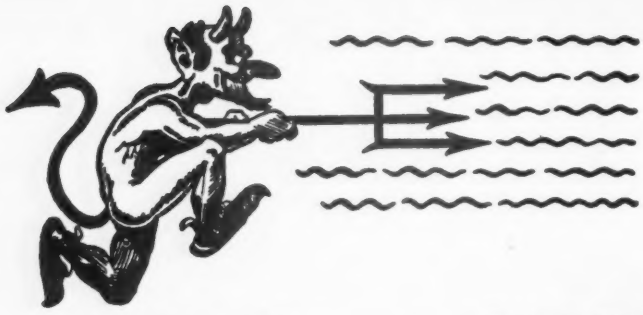
PLACE A TEST ORDER TODAY

Packed in orange striped 100-pound bags with this tag.

*U. S. Patent #2184926 (other patents pending)

Pangborn

BLAST CLEANS CHEAPER with the right equipment for every job



Soffel's

Exothermic CARBON FREE Liquidizer

KEEPS FEEDING METAL MOLTEN 50% LONGER

SOFFEL'S EXOTHERMIC CARBON FREE LIQUIDIZER is the leader in major foundries for use on ferrous and non-ferrous metals, and in ingot production. It is the first and the original scientific non-carbon exothermic compound for feeding heads and risers.

SOFFEL'S EXOTHERMIC CARBON FREE LIQUIDIZER is different from ordinary head compounds in two ways: It is CARBON FREE, thereby eliminating carbon pick-up. It is EXOTHERMIC. Carbonaceous materials, regardless of their composition, will cause carbon pick-up, segregation, non-uniform grain structure and hard spots under risers and in castings. Carbonaceous materials contribute no added heat value or increased temperatures to the feeding metal and only act as an insulating cover.

NOTE THESE TYPICAL RESULTS FROM THE USE OF SOFFEL'S CARBON FREE LIQUIDIZER

This six inch by six inch chrome-nickel-steel riser, with the application of 1 pound of SOFFEL'S CARBON FREE LIQUIDIZER, the average weight was reduced from 32 pounds to 13 pounds, a savings of 19 pounds of saleable metal which normally would have been discarded as scrap, but which was fed into the casting and produced a heavier, sounder casting. Note the feeding head can be knocked off easily saving burning costs. There is no better feeding head compound at any price than SOFFEL'S CARBON FREE LIQUIDIZER.

SOFFEL'S EXOTHERMIC CARBON FREE LIQUIDIZER reacts within itself exothermically, producing a temperature above 3200° F., actually increasing the temperature of the feeding metal to a point well above that of the metal in the main body of the casting, thus ensuring that the feeding metal will be the last to freeze. Shrink cavities in the casting caused by premature freezing of the feeding metal are eliminated. After the exothermic action has ceased, the LIQUIDIZER forms a soft insulating blanket on the metal. This confines the heat generated by the LIQUIDIZER and aids in maintaining the desired high temperature of the feeding metal in the heads. It may also be used in localized sections of the mold when mixed with equal parts of facing sand.

Soffel's Thermotomic Compounds
for all metals and alloys

Patented

SOFFEL'S THERMOTOMIC COMPOUND is an exothermic molding compound which is molded and baked into any desired shapes just as sand cores are made. It is used as ring inserts under the risers or feeding heads and blind riser cracker cores. Also as a facing insert where it is desirable to maintain the fluidity of metal in the mold at those points where rapid cooling may cause piping, shrinkage or segregation. It produces a temperature up to 3500° F. Great savings are realized through the reduction in height of risers as well as the cost of removing feeding heads. SOFFEL'S CARBON FREE LIQUIDIZER should be used on top of the feeding heads in conjunction with the use of SOFFEL'S THERMOTOMIC COMPOUND. For green sand molds, use WATERPROOF THERMOTOMIC. On aluminum, use ABC and AL-X31, LIQUIDIZER on top of the heads.

BEWARE OF IMITATIONS! We are the originators of CARBON FREE LIQUIDIZER and THERMOTOMIC COMPOUNDS

Pittsburgh Metals Purifying Company

WORLD'S LARGEST MANUFACTURERS OF FLUXES AND PURIFIERS FOR ALL METALS AND ALLOYS

1352 MARVISTA ST., N.S. **PITTSBURGH 12, PA.**

(*Concluded from page* 140)

as Detroit superintendent. **John W. Kelin** has been named midwestern sales manager, directing an organization having headquarters in Whiting and district sales offices in Detroit under Mr. Nichamin, Cincinnati under **Ben J. Lippert,** Milwaukee under **John L. Kammermeyer** and Minneapolis under **Walter H. Schulte. George M. Baumann** has been appointed assistant general manager and purchasing agent of the midwestern department.

♦ ♦ ♦

Joseph E. Edens has joined the sales department of Lebanon Steel Foundry, Lebanon, Pa. Mr. Edens was graduated from Virginia Military Institute and was formerly associated with British-American Tobacco Corp.

♦ ♦ ♦

Thomas W. Curtin, formerly assistant director of purchases, has been appointed director of purchases, Philadelphia Division, Yale & Towne Mfg. Co., succeeding **W. B. Crossland,** resigned. A graduate of Pratt Institute, Mr. Curtin has been associated with the company since 1923, and prior to 1946 was assistant purchasing agent in the Stamford, Conn., Division.

♦ ♦ ♦

W. H. Bolger has been named manager of laboratories, and Cromwell Bowen, assistant manager of laboratories, Robert W. Hunt Co., engineers, Chicago.

♦ ♦ ♦

Austin L. Hawk has been appointed assistant manager of the western sales district, Manhattan Rubber Division, Raybestos-Manhattan Inc., Passaic, N. J., with headquarters at 445 Lake Shore Drive, Chicago. **S. V. V. Hoffman** has been named regional manager of the division's West coast sales division for southern California with headquarters at 4651 Pacific Boulevard, Los Angeles. **A. N. Johnston Jr.,** has become assistant manager of the central sales district, located at 810 Empire Bldg., Pittsburgh, and **D. H. Cottrille,** West Virginia regional manager at Clarksburg, W. Va.

♦ ♦ ♦

L. F. Bross has been named manager of the rail and track fastenings department, Robert W. Hunt Co., Engineers, Chicago, succeeding **A. A. Bareuther,** who has been granted leave of absence due to poor health.

♦ ♦ ♦

D. A. Lawson has been appointed sales manager, Gas Appliance Division, Herron Stove & Foundry Co., Chattanooga, Tenn., maker of stoves and light gray iron castings. Mr. Lawson has been associated with the home heating appliance field since 1928.

♦ ♦ ♦

Wilder G. Penfield Jr. has been appointed export manager of the Chemical Division, Borden Co., New York. A graduate of Princeton University, Mr. Penfield was assistant export manager, Remington Rand Inc., New York, prior to joining Borden Co. in that capacity early this year.

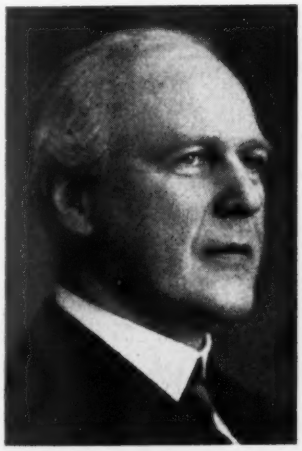
Three Honorary Life Memberships Are Awarded by IBF

IN recognition of valuable services to the foundry industry over a long period of years, these three prominent foundrymen have been elected honorary life members of the Institute of British Foundrymen:

Dr. James T. MacKenzie, technical director, American Cast Iron Pipe Co., Birmingham, with which he has been associated since 1912. Outstanding for his achievement in experimental and research work, Dr. MacKenzie has incorporated results of his activities in papers presented before various technical groups of which he holds membership. In 1927 and 1938 he was author of the American Foundrymen's Society exchange papers presented before the IBF. Dr. MacKenzie is a director of the AFS.

Oliver Smalley, president, Meehanite Metal Corp., New Rochelle, N. Y. A native of Chesterfield, England, Mr. Smalley is a graduate of Sheffield University and London University. In England he was associated with the steel mills of Cammell Laird & Co. Ltd. and W. G. Armstrong Whitworth & Co. In 1925 he came to the United States and joined with A. F. Meehan in forming the Meehanite Metal Corp. At present he is operating foundry activities in many countries and directs a number of research organizations for the Meehanite company. For 30 years he has contributed to technical and scientific societies and has been previously honored by the IBF for outstanding contributions to the progress of the foundry industry.

Daniel Sharpe, director of Foundry Plant & Machinery Ltd., Glasgow, Scotland, which has manufacturing rights in Great Britain of the sand slinger. A former president of the IBF, Mr. Sharpe was educated in Scotland and gained his metallurgical training with Steel Co. of Scotland Ltd. He was later associated with Acme Steel & Foundry Co. Ltd., Shettleston, National Steel Foundry Co. Ltd., Leven, Fife, Walter MacFarlane & Co. Ltd., Glasgow, and a number of other companies. In 1920 he visited the United States, visiting over 100 iron and steel foundries and returned to England to develop European patents on the sandslinger system of molding.



DANIEL SHARPE

DR. J. T. MacKENZIE

OLIVER SMALLEY

Reinforced Plastic Core Driers

Developed for Electronic Baking

By FRANCES A. VAINOSKY
Plastics Department
American Cyanamid Co.
New York

UNTIL recently, the use of electronic baking was limited to cores of relatively simple shapes. This was not because of limitations inherent in electronic ovens, but because of the lack of a suitable material for fabricating the driers used to support cores of more complicated shape on their travel through the oven.

The driers must be fabricated from a material which does not conduct high - frequency current. This eliminates the cast aluminum used in conventional core drying, since it would quickly dissipate much of the available heat, leaving the core improperly baked. Various nonmetallic materials have been used successfully when only a flat plate is required to support the core.

There has been an active search for a suitable drier material which would enable the foundryman to use it on a greater variety of parts. In the course of extensive research and evaluation, several foundries have found that a relatively new plastic material, American Cyanamid's Laminac Resin, reinforced with Fiberglas provides the desired combination of these properties: Resistance to high frequency, resistance to the impact of the corebox, resistance to the abrasion of repeated machine blowing, arc resistance, rigidity, ease of fabrication, and accurate reproducibility.

Success with core driers is now leading to the use of these materials for coreboxs as well. Once provision is made for making the cavities reversible, coreboxes can be made from the same molds used to form the driers, at much less cost than casting and machining aluminum. Further, precise duplicates are readily obtained in reinforced-plastic molding. Performance at the blow station is excellent. One corebox, designed for 1¼-inch elbows, has been blown 10,000 times without detrimental wear.

The techniques which produce driers and boxes from these recently developed materials are new to the pattern shop, and considerable time has been spent in mastering the practice, and in orienting personnel in its use. The following paragraphs describe the process developed by one large eastern foundry.

Molds, made from aluminum with a steel frame, are used for fabricating core driers for nine different tees and elbows. The first step in producing a core-drying tray from one of these molds is the applica-

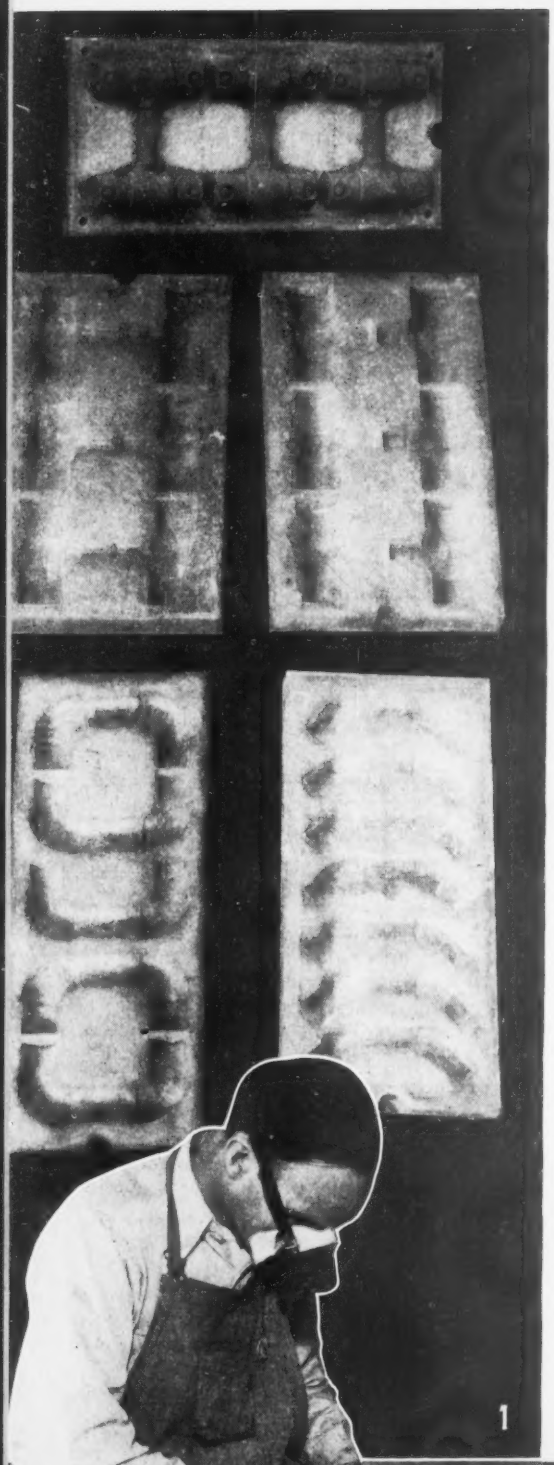
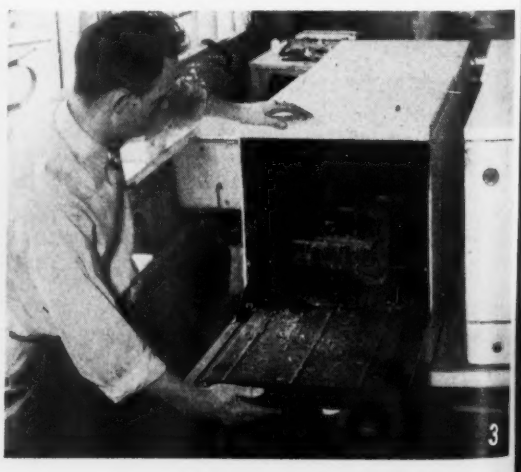


Fig. 1—Examples of core driers made from resin reinforced with Fiberglas.

Fig. 2—Driers are made by placing alternate layers of resin and glass in an aluminum mold. The assembled mold is cured (Fig. 3) in an electric range



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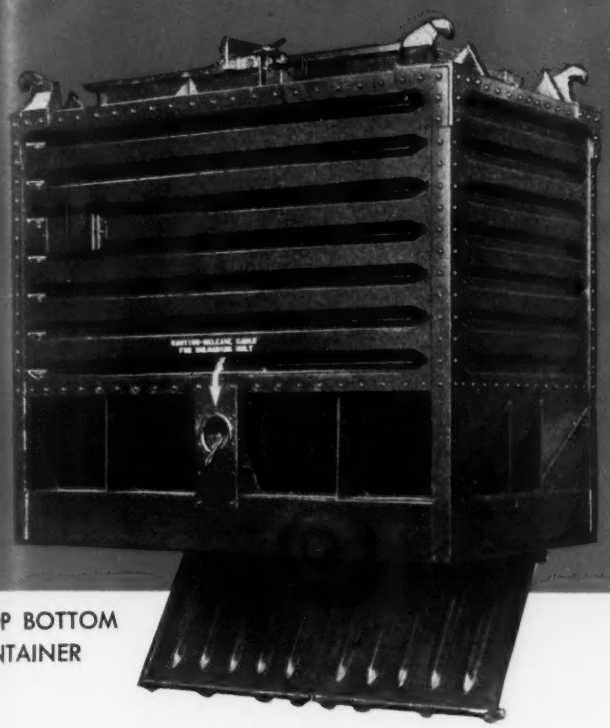
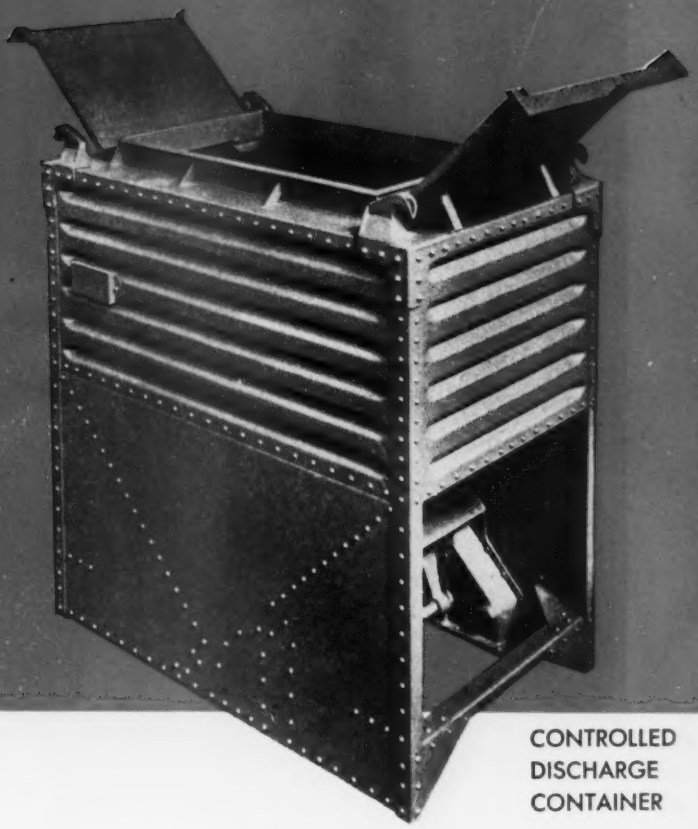
AFE, EFFICIENT HANDLING
F ALL BULK MATERIALS



DROP BOTTOM
CONTAINER



CONTROLLED
DISCHARGE
CONTAINER

These newly developed steel containers, shown at the recent Materials Handling Exposition in Chicago, are already assisting in varied types of industries in the handling of bulk materials, adding speed to the process, and, at the same time, cutting the costs thereof.

At the left, above, is the Drop Bottom Container, which permits a *quick* and *complete* discharge of its contents. Designed to handle both fine and coarse materials, the container may be unloaded either by (1) opening the bottom door by means of a cable release while container is suspended in mid-air, or (2) by placing container on the ground, releasing the discharge door and then slowly raising the container. The container is equipped with an automatic locking device, which insures locking when the container is placed on the ground. This container can be furnished with a top, weather-proof door, or can be an open-top type, depending on the customer's needs. The container weighs about a ton, will take a load up to eight tons, and has a capacity of 145 cubic feet.

At the right, above, is the Controlled Discharge Container which is equipped with a geared type rotary discharge valve so as to secure controlled flow & *partial* discharge of its contents. The container has a hopper type bottom with a single opening of approximately 18 inches, extending the full width of the container. The valve is automatically locked when in the closed position. This container can be open-top design or equipped with a weather-proof cover. Weighs slightly over one ton and will hold up to eight tons. This container, similarly, has a capacity of approximately 145 cubic feet.

Let us consult with you on your problems of handling bulk materials

THE YOUNGSTOWN STEEL DOOR CO.

Camel Sales Company · Camel Company Limited

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Try one simple change in your present backstand set-up. Using the same grinder, the same type of abrasive belt by CARBORUNDUM, remove the contact wheel and replace it with our new serrated rubber "61" wheel.

Put the machine back to work. See for yourself how stock removal rates go up, how much longer the belt cuts, how belt changes are reduced. Watch for a better finish, less fatigue from your operator. Best of all, check your abrasive costs. They may be as much as 50 per cent less. See your CARBORUNDUM representative or distributor about the new "61" wheel. Or write Dept. F 82-130 for full details.

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82-130

Fig. 4—Drier cavities being scraped by hand to close tolerances

tion of a parting agent, Vejin, by brush. After a small quantity of Laminac Resin 4116, catalyzed with Lupersol DDM, is poured into the mold, a layer of Owens - Corning's 1.5 - oz, polystyrene - treated Fiberglas mat, number M503, treatment 16, previously cut to the desired outlines, is inserted. This process is repeated until the drier is built up to the desired thickness with alternate layers of resin and glass. The assembled mold is weighted with 50 - to - 100 - lb iron blocks and placed in an oven which, in this case, is an ordinary home electric range. The driers are allowed to cure at 325 - 350°F for 30 to 45 minutes, depending on the size of the part. When the molds are removed from the ovens, they are submerged in cool water to bring them down to handling temperature. Knock-out pins facilitate the removal of the drier from the mold.

With "blow-in" driers, more than half of the cost of the reinforced-plastic type presently comes from the finishing operations required after molding. "Turn-in" type driers require little finishing, since dimensional tolerances are not so critical.

On the driers used for machine blowing, burrs and irregularities are sanded away with a garnet - paper power wheel, and the backs and faces of the driers are ground to dimensions on a Blanchard grinder. Then, because variations in shrinkage and warpage during the molding process presently make it impossible to produce finished parts to the desired tolerances, the cavities of the drier (the core-supporting surfaces) are scraped by hand to close tolerances with slim-taper files, bent to suitable shapes. Holes for the matching pins are drilled from a jig matched to the corebox. After the underside of the drier has been sand blasted to remove any foreign substances which might contribute to arcing as the drier travels through the high voltages of the electronic oven, the drier is ready for the blow station.

At the blow station, 960 cores are now being produced per hour; the standard previously used in establishing piece - work rates was 196.

When the core driers are used with a corebox which is fastened to the head of the core - blowing machine, the matching - pin holes in the driers eventually wear sufficiently to cause imperfect alignment, usually after approximately 1000 blows. Although the wear is insignificant when the corebox is used "loose", i.e. positioned on the core drier by hand, production is slowed down by 30 to 40 per cent.

Methods of overcoming this wear in the pin holes are under evaluation. Work is also planned on methods for minimizing the variations in shrinkage during the molding process, to reduce the cost of finishing driers to the desired tolerances. The economics of molding the driers in presses are also being studied; a 3-4 minute molding cycle, versus the present 30-45 minutes, may make an investment in presses profitable.

Work in progress indicates that various refinements in techniques, along with increased know - how among the plant personnel in the use of reinforced plastics, will enhance even further the value of these new types of core driers and boxes, and their contribution to the growing use of electronic baking.

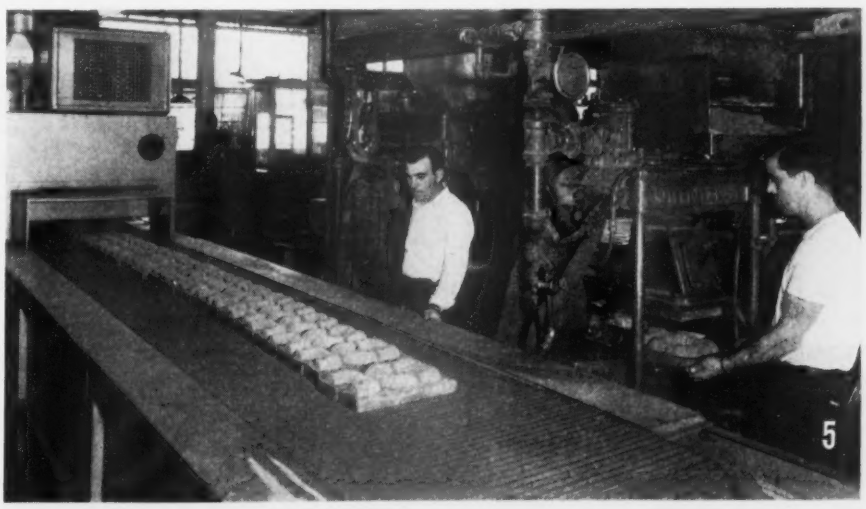
Book Review

Timestudy Fundamentals for Foremen, by Phil Carroll, cloth, 209 pages, 4¾ x 7¼ in., published by McGraw-Hill Book Co., New York. Price $3.

Information is presented on what to do in starting a timestudy, how the time elements involved can be recorded, and the necessity for comparing several such studies before setting standards of performance. Compilation of results of time studies, and the proper charting of them so as to arrive at standards, are explained with appropriate diagrams and instruction. Descriptions of four basic types of wage incentive plans developed as a result of timestudies also are included.

Throughout the book, the author emphasizes ways and means of securing and retaining the co-operation of operators whose take-home pay is directly affected by the wage incentive plans adopted as a result of such timestudies. Numerous self-test questions, cartoon-type illustrations and simplified diagrams are designed to emphasize the key features involved in making and interpreting timestudies.

Fig. 5—Cores blown into plastic driers being fed to electronic oven



COMPLETE PRESSURE CASTING EQUIPMENT
PILOT MODELS—FOR INDIVIDUAL PLANT USE

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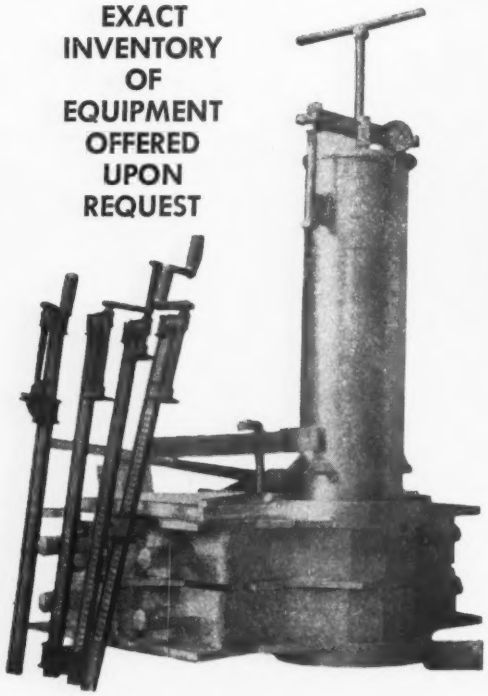
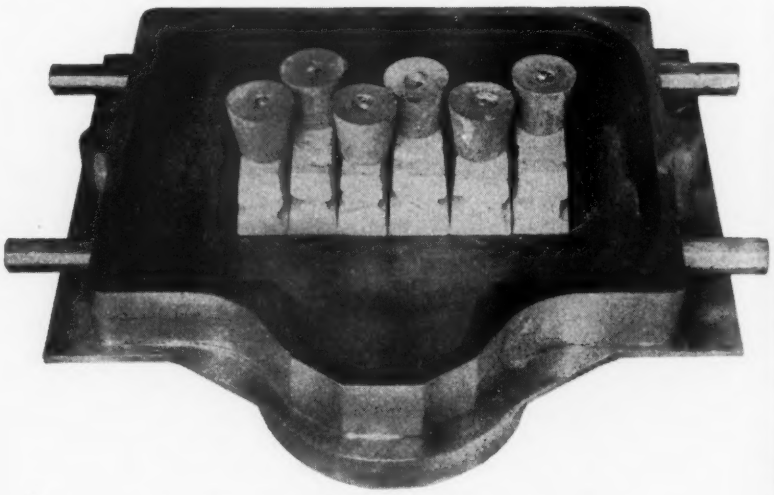
WE CAN SUPPLY YOU WITH A SMALL COMPLETE SET-UP OF PRESSURE CASTING EQUIPMENT TO PRODUCE 6, 9 OR 12 MATCHPLATES WEEKLY, ALSO PRODUCTION EQUIPMENTS.
THIS EQUIPMENT IF OPERATED AT FULL CAPACITY WILL PAY FOR THE INVESTMENT AND SHOW PROFIT IN 4 MONTHS. $765.00 - $965.00 - $1,185.00 F.O.B. Our Plant

EXACT INVENTORY OF EQUIPMENT OFFERED UPON REQUEST



Pressure Casting Press and Injection Cylinder



Multiple Matchplate Mold in Process

- **Matchplates of average sizes can be produced with these equipments.**
- **Also any type of aluminum core boxes, loose patterns and precision castings in non-ferrous metals.**
- **Complete pressure casting instructions, blueprints and sources of supplies furnished**
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Tentative Specifications for

GRAY IRON CASTINGS FOR PRESSURE-CONTAINING PARTS FOR TEMPERATURES UP TO 650 F

ASTM Designation: A 278—51 T

Issued, 1944; Revised, 1949, 1951.

Scope

1. These specifications cover gray iron for castings suitable for pressure-containing parts for use at temperatures up to 650 F.

Manufacture

2. (a) The melting procedure shall be optional with the foundry.

(b) Castings intended for use above 450 F shall be stress relief annealed. The castings and test bars shall be stress relieved by placing them in a suitable furnace at a temperature not exceeding 400 F, heating them uniformly to a temperature of not less than 900 F nor more than 1050 F, and holding them at the selected temperature for not less than 1 hr. nor more than 2 hr. per inch of thickness of the thickest section. The heating and cooling rates shall be uniform and shall not be more than 400 F per hr. for castings of 1 in. maximum section, nor more than 400 F divided by the maximum section thickness in inches for thicker castings.

(c) Castings of classes Nos. 50 and 60 which are to be used at temperatures below 450 F and not stress relieved in accordance with Paragraph (b), shall be relieved of stress by cooling them in the mold or by other means, from the pouring temperature to 500 F at an average rate of not more than 100 F per hr for castings up to 1 in. in section, nor more than 100 F divided by the maximum thickness in inches for sections greater than 1 in.

Tensile Strength Classification

3. (a) Gray iron castings conforming to these specifications shall be known and listed by classes (Notes 1, 2 and 3), according to the following minimum requirements as to tensile strengths of test bars:

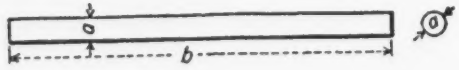
Class	Tensile Strength, min, psi
No. 20	20,000
No. 25	25,000
No. 30	30,000
No. 35	35,000
No. 40	40,000
No. 50	50,000
No. 60	60,000

(b) For temperatures above 450 F, only classes 40, 50 and 60 shall be used.

Correlation of Test Bars and Castings

4. (a) The purchaser shall designate the controlling section, but the manufacturer and purchaser shall be in agreement as to the size and type of the test bar or coupon which will best represent the quality of the iron in the casting, before the latter is made.

(b) Castings weighing less than 2000 lb each and having controlling sections less than 1½ in. in thickness, shall be represented by separately cast test bars. Castings in this weight range processed in continuous production from the same melt, may be approved on the basis of one test per hour. Castings poured intermittently during the day, but from iron of the same melt and strength classification, for which test bars are taken at the beginning, middle and end of heat during an 8-hr day, or alternately, every 4 hr, may be grouped in lots not exceeding 4000 lb each, and submitted as single test units.



Test Bar	Dimensions: Diameter, in.	Dimensions: Length, in.
A	0.875	15
B	1.20	21
C	2.00	27

Fig. 1—Typical Test Bars

(c) Castings which weigh in excess of 2000 lb, or which have a controlling section greater than 1½ in. in thickness, or both, may be represented either by a coupon cast integral with the casting, or by a separately cast bar or coupon. In either case, the size of the bar or coupon and its rate of cooling shall closely approximate that of the controlling section of the casting represented (Note 4).

(d) Three diameters of separately cast test bars and the controlling sections which they normally represent are given in the following table and are considered standard under these specifications (see Fig. 1). A special provision is made for controlling sections exceeding 2 in.

Controlling Section of Casting, in.	Test Bar	Nominal Diameter of Test Bar as Cast, in.
0.50 and under	A	0.875
0.51 to 1.00	B	1.20
1.01 to 2.00	C	2.00
Over 2.00	..	[a]

[a] A larger test bar shall be used in accordance with Section 4 (a) (Notes 5 and 6).

Tentative Specifications for

GRAY IRON CASTINGS FOR PRESSURE-CONTAINING PARTS FOR TEMPERATURES UP TO 650 F

ASTM Designation: A 278—51 T

Issued, 1944; Revised, 1949, 1951.

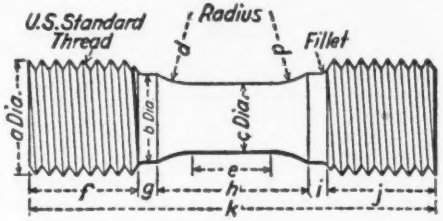
Molding and Pouring Test Bars

5. (a) Integrally cast or separately cast coupons or test bars, other than those listed in Section 4 (d) shall be made under the same sand conditions as the castings (Notes 5 and 6). Separately cast bars shall be poured from the same ladle of iron used to pour the castings.

(b) All test bars or coupons shall be heated in the same furnace charge and immediately adjacent to the castings they represent (Notes 7 and 8).

Tensile Strength Test Procedure

6. (a) Where the half-section of the test coupons equals or exceeds 2 in., the tension test specimen (Specimen C of Fig. 2) shall be taken parallel to the longer axis and midway between the surface and center of the section.



Dimensions of Tension Test Specimens, in.

Dimension	Specimen A	Specimen B	Specimen C
a	3/4	1 1/8	1 7/8
b	5/8	7/8	1 1/2
c	0.505	0.750	1.25
d	1.00	1.00	2.00
e[a]	Shall be equal of greater than c (diameter)		
f	1.00	1.00	1 3/4
g	0.25	0.25	1/4
h, min.	1.25	1.50	2 1/4
i	0.25	0.25	1/4
j	1.00	1.00	1 3/4
k, min.	3.75	4.00	6 3/8

[a] Length of parallel.

Fig. 2—Tension Test Specimens Machined from Typical Test Bars

(b) Tension test specimens shall be machined to the dimensions shown in Fig. 2, and they shall fit the holders of the testing machine in such a way that the load shall be axial. The use of self-aligning shackles is recommended (Note 9). After reaching a stress equivalent to 15,000 psi, the speed of the moving head of the testing machine shall not exceed 1/8 in. (0.125 in.) per min.

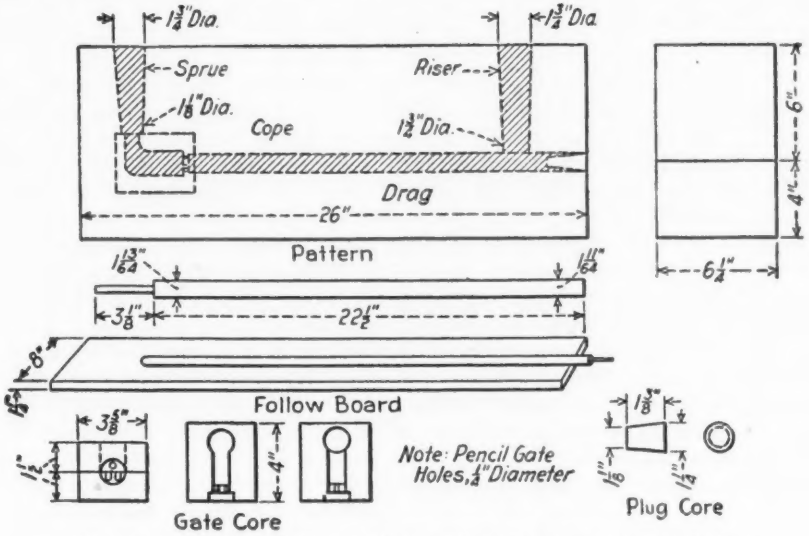


Fig. 3—Typical Test Bar, 1.20-in. Diameter, Cast Horizontally

Number of Tests

7. (a) The manufacturer shall prepare and furnish sufficient test bars to meet the test requirements.

(b) If a faulty test bar gives a result not in accordance with these specifications, the result shall be disregarded and another test made.

(c) If an apparently sound test specimen fails to conform to these specifications, two retests shall be made. If either retest fails to conform to these specifications, the castings shall be rejected.

Chemical Composition

8. (a) It is the intent of these specifications to subordinate chemical composition (as determined from the test specimen) to mechanical properties. Cast irons for service at temperatures above 450 F shall be limited to the classes Nos. 40, 50 and 60 having a maximum carbon content equivalent

(To be concluded in November issue)

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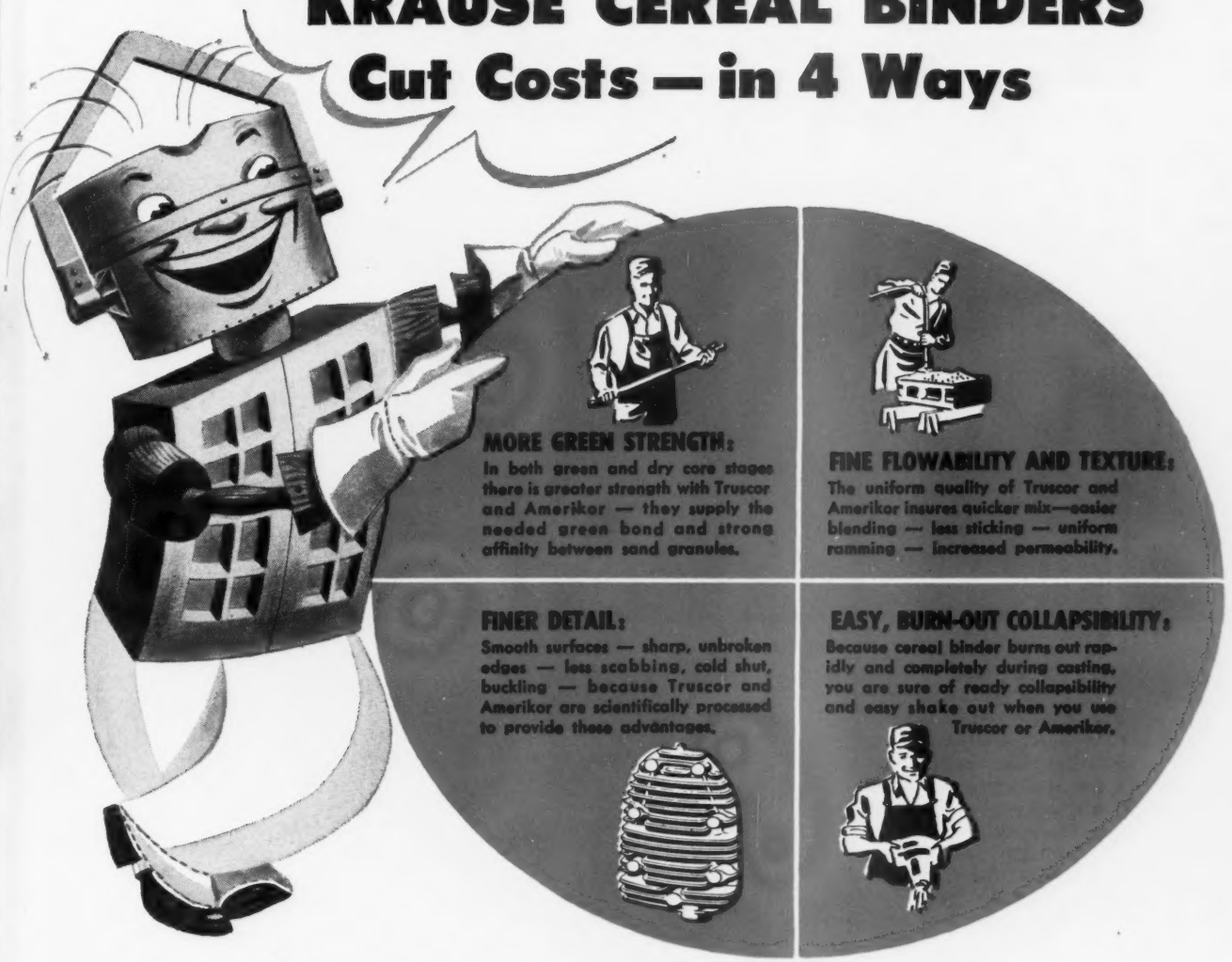

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NEWS VIEWS

▲ **METAL ANALYSIS:** To speed analysis of its heats, the Scovill Mfg. Co., Waterbury, Conn., installed a 1000-ft-long pneumatic tube system between its melting department and metals research laboratory. Samples are placed in an envelope and inserted in a carrier. Reports are sent back promptly by the laboratory by a return tube. Formerly an hourly messenger service was employed. The installation was made by the Lamson Corp., Syracuse, N. Y.

▲ **SAFETY:** W. R. Sweeney (left), Mine Safety Appliances Co.'s International Division, demonstrates a new automatic artificial respiration instrument to safety, labor and management officials from Sweden, Norway, Denmark and Turkey on a visit to the company's Pittsburgh headquarters. The group was the first industrial safety team to be brought to this country by the Department of Labor and ECA.

▲ **FOUNDRY FLOAT:** Brillion Iron Works Inc., Brillion, Wis., advertised its products and the foundry industry with this float at a Lions state convention in Manitowoc, Wis. The model cupola poured a fluorescent fluid, accented with black light, to simulate hot metal. Flares at the top of the stack spouted smoke and flame.

← **SIMPLIFIES DRILLING:** To simplify drilling heavy castings, Racine Pattern Works, Racine, Wis., replaced the regular base of a standard Delta 17-in. drill press with a three-leg spider base. Instead of moving the work, the drill press is slid to several positions along the flange of heavy bathtub castings.

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Activities of Foundry

GROUPS

Chicago

MORE than 1000 members and guests of Chicago Chapter of the AFS, converged on the Lincolnshire Country Club in Crete Township, Ill., Aug. 11, for the Chapter's annual stag outing and golf. Sunny skies and a temperature in the middle 80's provided weather which was the best to favor the event in recent years.

For a considerable number, golf was the main attraction. Others participated in a horseshoe pitching tournament before a good gallery. For those choosing less arduous activity there was matinee entertainment.

As usual, a weight guessing contest drew much interest. Six castings, including bronze, copper, aluminum, magnesium, steel and gray iron, weighing a total of 481 lbs 13 oz, were displayed. The winning guess, made by Elmer Syler, Swanson Pattern & Model Works, East Chicago, was 481 lbs. 6½ oz. Surprising as it may seem, guesses ranged from 45 to 1800 lbs.

At 7 p.m. interest centered in the Big Tent where a country fried-chicken dinner was served. Immediately thereafter prizes were distributed to winners in golf and horseshoes, the weight-guessing contest and to holders of lucky tickets. Several floor show acts concluded the day's program.

Chairman of the entertainment committee for the fourth year was Robert M. Jones, superintendent of foundries, South Works, United States Steel Co., while secretary of many years' service was Harry E. Cullen, director of recreation for the same company.

Other members of the committee included: John J. Behan, National Carbon Co.; George J. Biddle, Illinois Clay Products Co.; R. H. Burnell, Federal Foundry Supply Co.; F. B. Flynn, S. Obermayer Co.; J. C. Gore, Foundry Products Division, Archer-Daniels-Midland Co.; C. C. Kawin, Charles C. Kawin Co.; T. J. Magnuson, J. S. McCormick Co.; S. E. McGinty, Firegan Sales Co.; A. A. Milkie, Hewitt-Robins Inc.; N. L. Mooneyham, Kordell Industries Inc.; H. J. Pfeifer, Electro Metallurgical Sales Corp.; E. C. Reimann, Wisconsin Steel Co.; H. G. Slichter, Beardsley & Piper Co.; E. W. Smith, Western Materials Co.; H. C. Swanson, Arrow Pattern & Foundry Co.; and H. K. Swanson, Swanson Pattern & Model Works.—*Erle F. Ross*

CHICAGO Chapter of the AFS held its annual stag outing and golf party Aug. 11 at Lincolnshire Country Club, Crete Township, Ill. Photos by I. H. Dennen, Beardsley & Piper

Northeastern Ohio

APPROXIMATELY 180 attended the opening meeting of Northeastern Ohio Chapter of the AFS at Tudor Arms Hotel, Cleveland, Sept. 13. Principal speaker was Ben H. Taylor, employee relations division, B. F. Goodrich Co., Akron, O. He spoke on "Today's Challenge in Human Relations."

(*Continued on page* 156)

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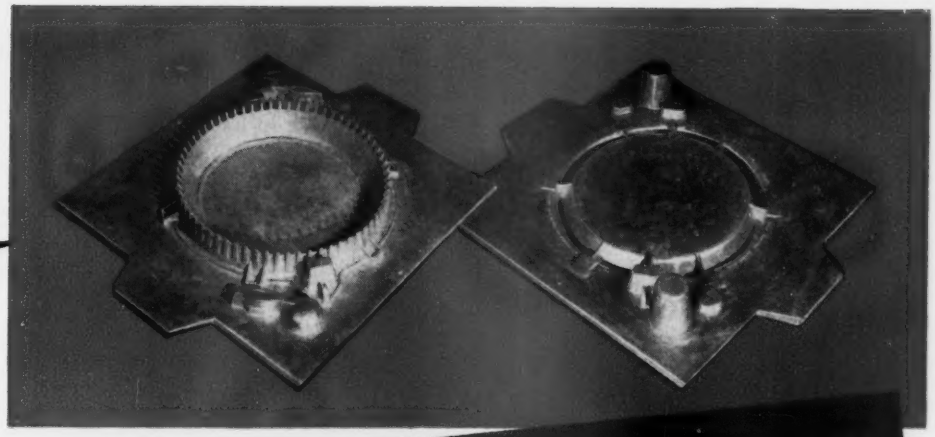

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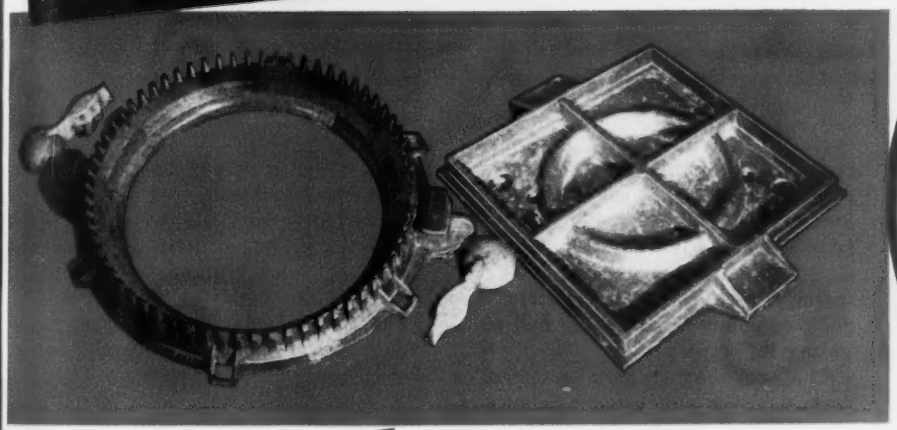

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SOUTHERN CALIFORNIA Chapter of the AFS held its final meeting of the season June 8 at Rodger Young Auditorium, Los Angeles. At left above are a group of past presidents at the meeting. Front row, left to right, are: W. F. Haggman, Haggman Foundry Supply; Robert Gregg, Reliance Electric Division and national AFS director; Al Zima, International Nickel Co., and James Eppley, Axelson Mfg. Co. Back Row: William Emmett, Los Angeles Steel Casting Co.; H. E. Russill, Eld Metal Co.; Earle Shomaker, Kay Brunner Steel Products Co.; W. D. Bailey Jr., Westlectric Castings Inc., and Earl Anderson, Enterprise Iron Works. At right, left to right: Henry Howell, Howell Foundry Co., incoming chapter president; Robert C. Stone, Federal Bureau of Investigation, principal speaker, and John E. Wilson, Climax Molybdenum Co., retiring president. Photos by Ken Sheckler, Calmo Engineering Co.

(*Continued from page* 154)

Mr. Taylor called attention to the tremendous material progress that has been made in this country during the first half of the twentieth century and stated that the second half might bring as much progress in the art of getting along with one another. Up to the present, progress in human relations has not been as good as it could have been because we have overlooked the foundation on which getting along together is based.

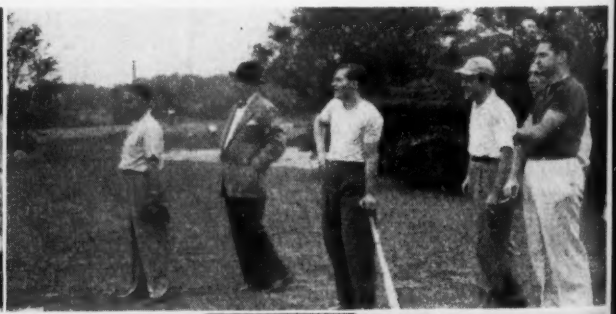
That foundation, according to the speaker, is the conducting of supervisory efforts over other people in such a way as to get the best results from supervision. Because a worker's attitude is determined by a great many things which management says or does not say, does or does not do, Mr. Taylor recommended that management follow an active and positive policy in educating and cultivating its employees.

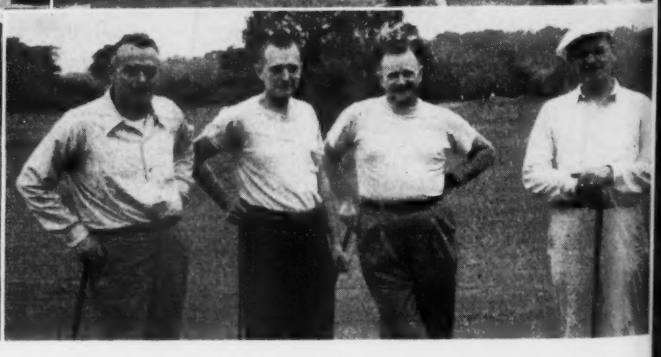
The best way to gain co-operation from workers and bring harmony into employee-employer relations is to help employees be sure of their own right to believe in themselves as they would like to be. In the speaker's opinion this is the major desire of all people.

He went on to say that the average American gets his right to believe in himself from his job—from what he does with his hands and his brain. To help him realize that faith, industry must show him a purpose in the work he does. He must be given a sense of pride of accomplishment. Criticizing must be done tactfully so that the worker will not feel that his work has no purpose or that he is inferior to what he thinks himself to be.

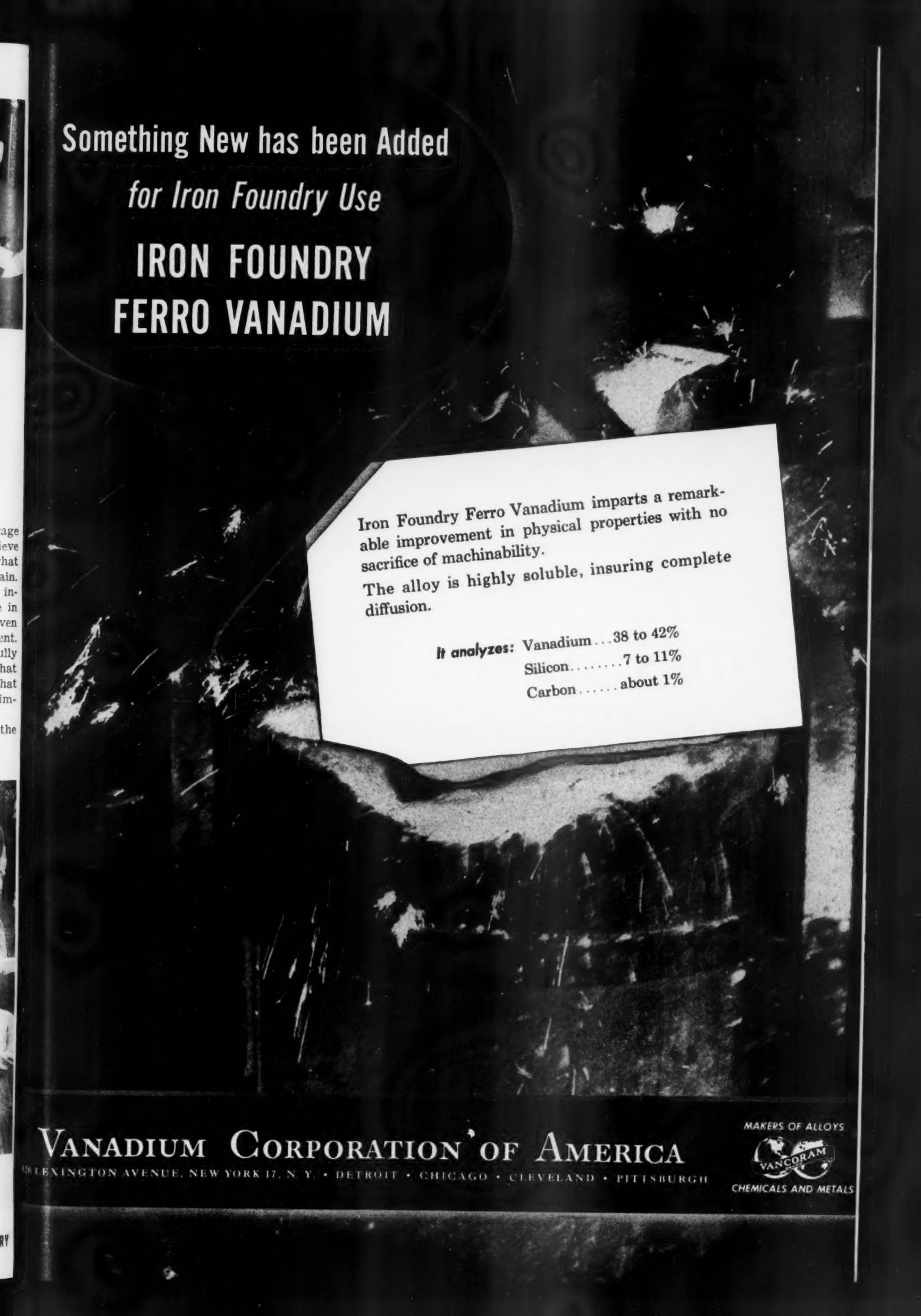
Furthermore, according to the

(*Concluded on page* 159)





NORTHEASTERN OHIO Chapter of the AFS held its annual summer outing at Lake Forest Country Club, Hudson, O., June 30. Golf, horseshoe pitching, good fellowship, a softball game between foundrymen and vendors, and dinner were features of the day. Photos by Sterling N. Farmer, Sand Products Corp.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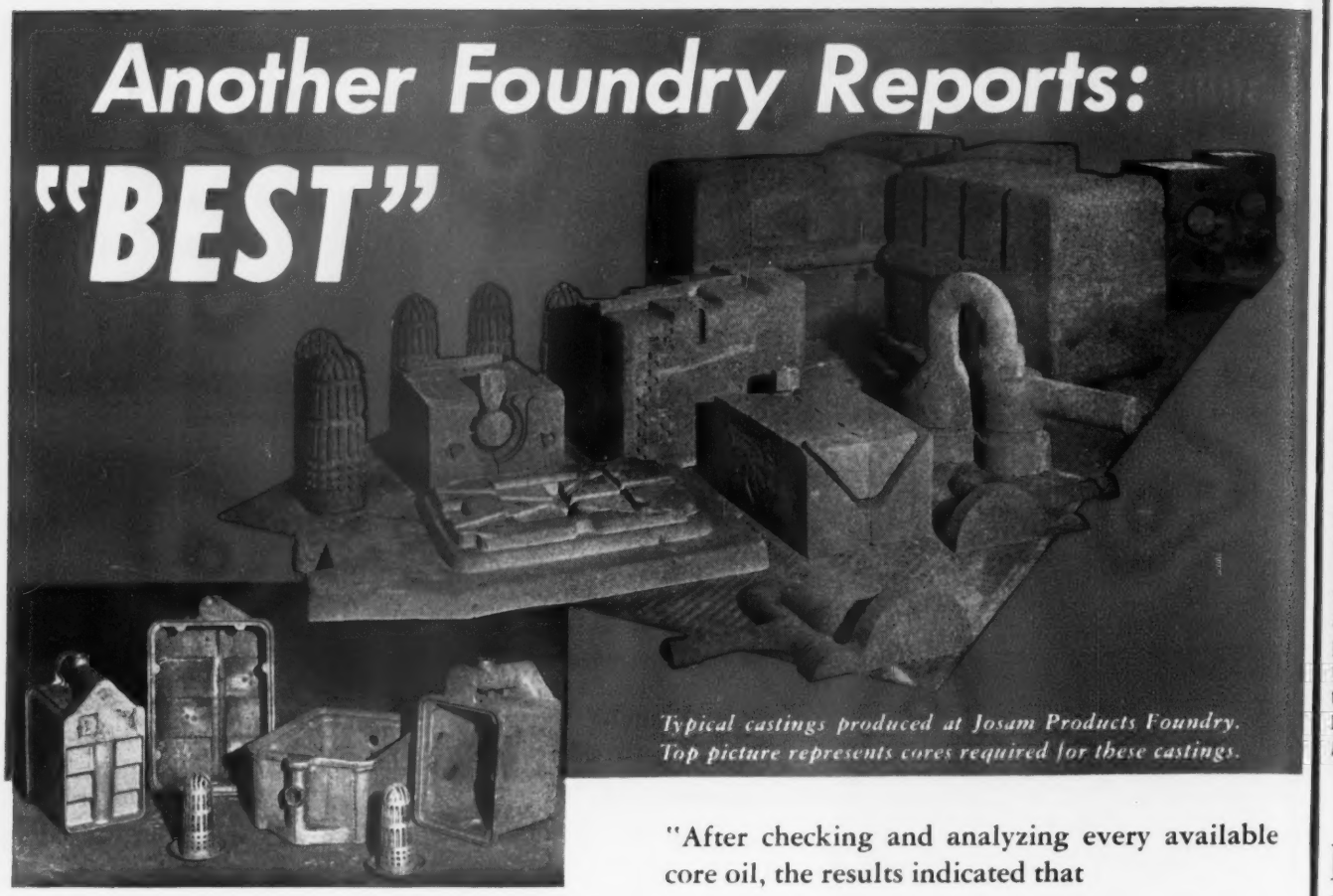

Typical castings produced at Josam Products Foundry. Top picture represents cores required for these castings.

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(*Concluded from page* 156)

speaker, employees must not be ignored because management feels it is too busy to pay attention to them. Being ignored hurts people more than anything else. They should be given a word of encouragement from time to time.

Of great importance in developing harmonious relations is the art of explanation. Management must take great pains in explaining company policies and the reason why it does some of the things it does.

Mr. Taylor's final point was that people mimic attitudes. If management has the proper attitude, believes in itself, knows what it is doing and has a purpose in doing it, then employees are likely to conduct themselves in the same manner.

In addition to Mr. Taylor's talk, Officer Daniel Jamieson and his assistant from the Cleveland Police Department showed a film prepared by the department, describing the operation of various branches of the city's law enforcement body.—*Robert H. Herrmann*

Birmingham

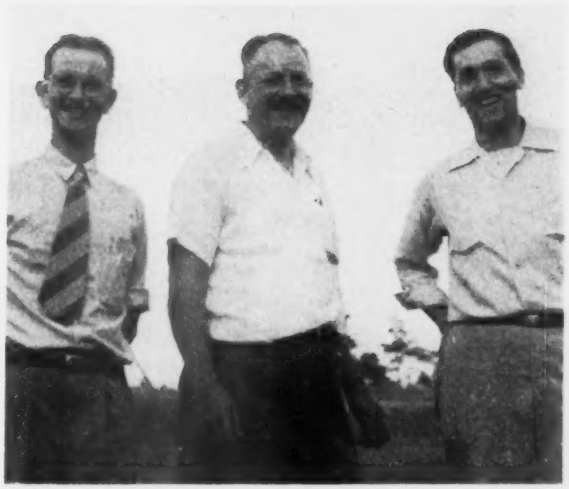
FIRST meeting of the 1951-52 season for Birmingham District Chapter of AFS will be held Oct. 19 at the Tutwiler Hotel, Birmingham. Fred Kramer, American Silica Sand Co., Ottawa, Ill., is the featured speaker and his talk is entitled "Traveling With a Grain of Sand." He will describe the mining and processing that sand goes through before it arrives at the pouring lines in foundries. Colored slides and film will be used to illustrate the trip from mine to foundry.

Eastern New York

FIRST annual picnic of Eastern New York Chapter was held in June at Endries Willow Grove Inn on the Schenectady-Ballston Spa road. Fifty-five members and guests were present to participate in a softball game, golf chipping contest and foot races for those so inclined. As so often happens, a golfer who never before held a club in his hands chipped closest to the pin to win first prize in the golf contest. The lucky lad was Don LaPointe, Rensselaer Valve Co., who also won prizes in other events. Other prize winners included Alex Cooke, Jim Kiesler and Gil Mirate of General Electric Co. and Bill Stevenson, Rensselaer Valve Co.

During the afternoon, Ray Willey of General Electric Co. displayed his mysterious talent with a dowsing rod. Many an attending foundryman found that in addition to his own skills, he possessed a hidden talent for locating water with a forked apple branch. The evening brought a delicious turkey dinner with all the trimmings. The outing was concluded with the installation of officers for the coming year who are: Jack Waugh, chairman; Leigh Townley, vice chairman, and Ed Lawrence, secretary-treasurer.

Credit for the success of the outing was due entirely to Newt Williams, George F. Pettinos Co., and Jack Waugh, General Electric Co., who teamed up to arrange a most enjoyable occasion.—*E. S. Lawrence, General Electric Co.*



EASTERN NEW YORK Chapter of the AFS held its first annual picnic outing at Endries Willow Grove Inn, June 16. About 55 were present. New officers installed at the meeting, left to right, are: Leigh Townley, Adirondack Foundries & Steel Inc., Watervliet, N.Y., vice chairman; Jack Waugh, General Electric Co., Schenectady, N.Y., chairman, and E. S. Lawrence, GE Co., secretary-treasurer

---

Nelson Pattern Co. has been incorporated in Milwaukee by Albert C. Heller, Harry V. and Paul Meissner.

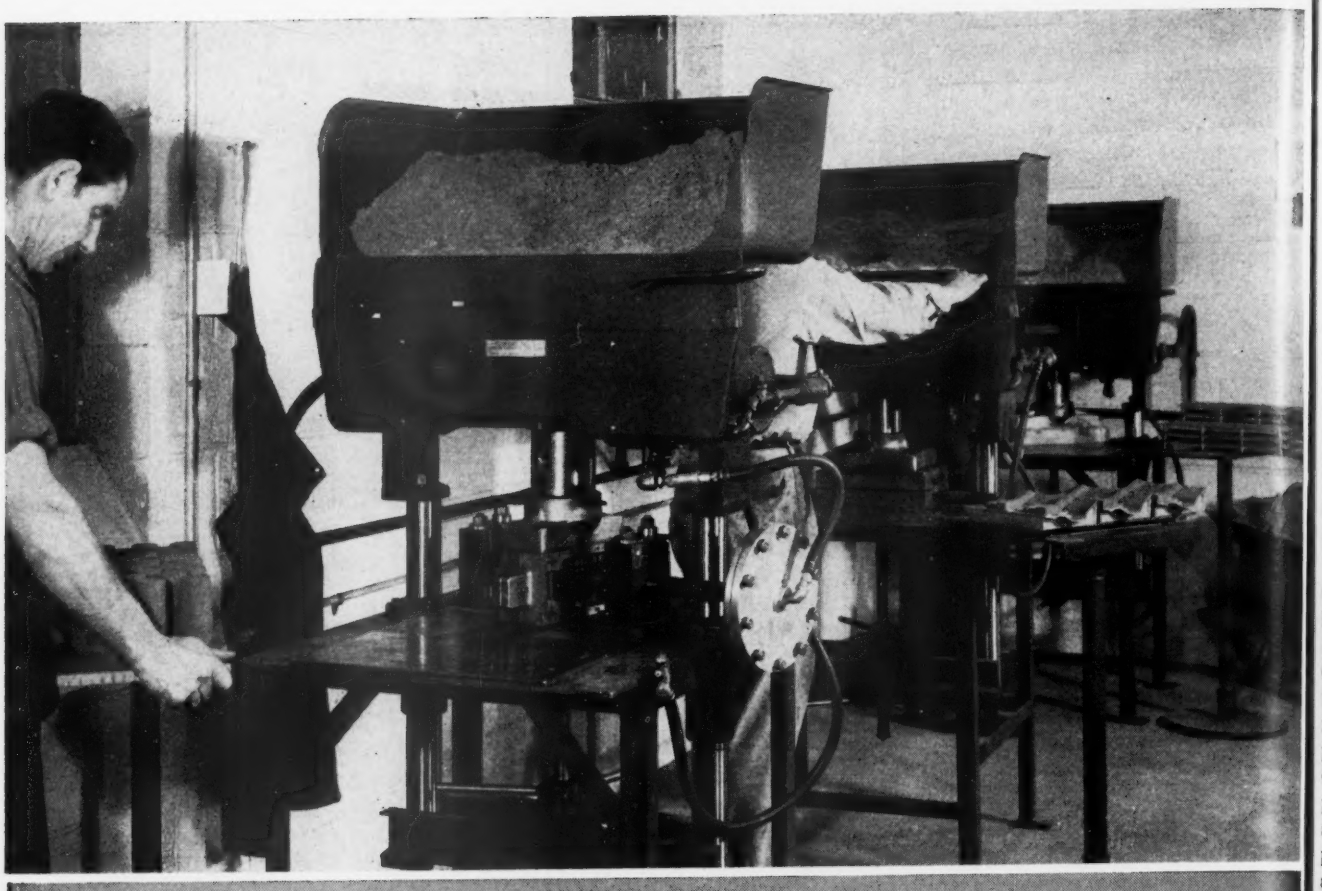
Book Review

Mineral Wool Insulation Specifications & Standards looseleaf, paper, published by Industrial Mineral Wool Institute, New York. Price $3.20.

This practical insulation handbook is intended as a guide in selecting materials and application practices for government contracts and as a basis for specification within industry itself. It covers types of mineral wool insulations, physical properties, characteristics, construction, selection, standard dimensions, temperature limits, thicknesses, auxiliary materials, application techniques, and testing methods.

Specifications by four government agencies and the American Society for Testing Materials are placed together in sections identified by celluloid tabs.

LANCASTER-YORK: Conestoga Foundrymen's Association held a picnic at Overlook Golf Club, Lancaster, Pa., July 28, featuring golf, quoits, bowling, refreshments, and a floor show. Shown at the outing, left to right, are: Lawrence Carey, Lancaster Malleale Castings Co.; John Mentzer Jr., Lancaster Foundry Supply Co.; Al Flury, Flury Foundries; David M. Keener, Burnham Corp. and CFA treasurer; Thomas Blank, Carbon Malleable Castings Co.; Henry Yeager, metallurgist; John Mentzer Sr., Lancaster Foundry Supply Co., and W. T. Sheffield, Hershey Machine & Foundry Co. and CFA president. Photo by Dave Garver, Lancaster Malleable Castings Co.



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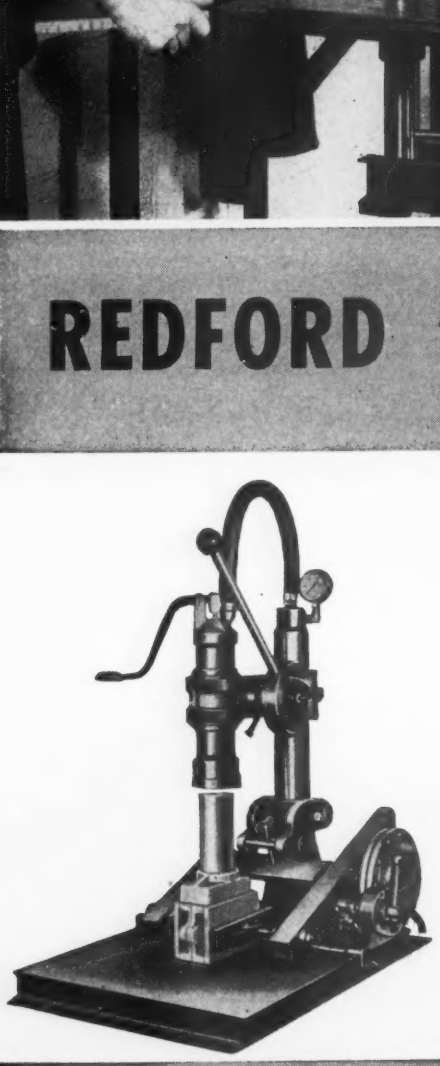

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Hints for the Job Shop

of Foundry Practice

By PAT DWYER, *Engineering Editor, FOUNDRY*

BARS are placed in a flask for the purpose of supporting the sand. They prevent the sand from falling out when the cope is removed from the drag and later while it is suspended over the empty mold. Also they prevent the sand from being forced upward by the pressure of the molten iron when the mold is filled. The pressure, as in the case of all liquids, is in proportion to the height of metal in the sprue.

To an amateur or a casual visitor in the foundry, the manner in which bars are placed in a cope might appear to be a matter of little moment. Only a man who has been brought up in an old-fashioned jobbing foundry can appreciate the many fine points involved in the construction. One of these shops usually was equipped with a bench axe and a hand saw and each man attended to his own repairing. In the course of time he was as proud of his ability to bar a flask properly as he was of his skill in making the mold. A typical shop handled a general line of jobbing castings, mining, marine, lumber, paper mill and steel works machinery. Many flasks, particularly those on the heavy floors, had to be changed constantly to accommodate various patterns.

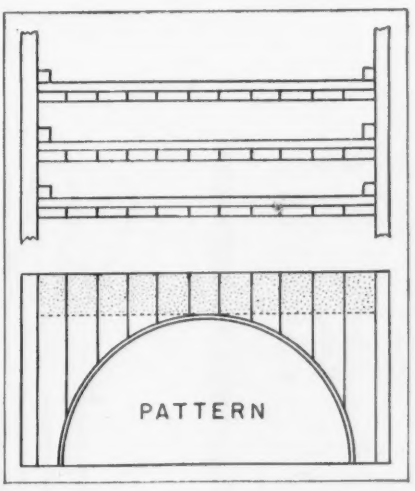
In the larger shops a foundry carpenter was employed. As in practically every section of the industrial field, some of these men developed an autocratic attitude, while others toiled away for years and years without developing ulcers. Snarly or subdued, after a few years practice, the foundry carpenter usually could give a molder lessons on the subject of barring a cope.

Provided one had the time or the opportunity, it was a positive treat and an education to watch a skilled carpenter strip a cope and rebar it. He knocked the old bars out with a light sledge hammer and left them in a pile for the cupola tender. With the willing or unwilling assistance of several helpers he lifted the stripped frame onto a large bottom board if one was available. If not he placed the frame on two long planks supported on suitable horses. He plucked out the nails remaining in the sides with a steel bar bent into a half circle at one end and split like a claw hammer. In the somewhat picturesque foundry nomenclature the tool was known as "a devil's claw." Construction of the bar enabled the operator to exert a leverage that would pull any nail up to and including a 6-in. spike.

The cope pattern was placed on the planks or board and adjusted to the best advantage approximately in the center. The carpenter chalk-marked the top of the sides into the required numbered of equal spaces for the bars and then, with his steel square, projected the lines down to the bottom of each side. A piece of wood, 1 x 1 in. and the full depth of the cope, was nailed vertically and securely at each mark. Then he proceeded to cut and fit the bars.

Wide boards extending from side to side and, if necessary, with a gap conforming to the upper contour of the pattern cut in the center, were nailed through the ends to the sides of the cope. The long 1 x 1 in. strips served as guide and brace.

Assuming that the pattern was for a pipe casting the bars were extended down to the joint line of the proposed mold. Pieces of board corresponding to the depth of the cope were cut and then nailed by the upper end to the long main bars. Where the casting was to be poured in a green sand mold, the ends of the vertical pieces were allowed to touch the joint at all points except in the immediate vicinity of the runner and gates. Pipe castings sometimes are poured through pop gates located on the flange or on the barrel. In cases of this kind all the vertical boards are allowed to touch the sand joint.



Method of barring large wood cope

Apparently this is a commonsense arrangement and yet it is rather surprising to find how many molders insist on keeping the edges of all bars at least ½-in. from the joint face. Clearance is necessary over a pattern, but it stands to reason that a bar touching the joint will support the sand better than if it is kept back ½-in. or more. This feature long has been recognized by makers of flasks designed to be used on molding machines. Machines are designed to facilitate production by eliminating unnecessary work on the part of the operator. Where the bars touch the joint, gaggers may be omitted. Every gagger, spike or soldier omitted means a gain of a few seconds in the cycle of production.

A molder cannot produce a good day's work unless he is supplied with the necessary flasks and other equipment. Instances are on record of owners complaining of the amount of work put up by their molders in shops where the equipment makes it impossible to make any kind of a showing. While a molder is engaged in nailing a flask, replacing a bar, patching an old bottom board or waiting for the crane or carpenter, he is not producing. Experience indicates that good flasks and equipment pay dividends. When a flask is unsafe or liable to cause trouble it should be sent to the cupola and replaced by a new one.

On standard or specialty work metal flasks should be provided for each job in sufficient number for a full day's work on each floor. It is the foreman's duty to see that all floors are up at wind time. A match board and a few metal flasks will increase the day's output to a remarkable extent. This discussion does not apply to conveyor line foundries.

In jobbing shops or shops where 50 per cent or more of the work is for the jobbing trade, it is necessary to provide flasks of many sizes. It is advisable to make flasks interchangeable, especially in what may be called the standard sizes, 14 to 48 in. square, 12 to 24 in. deep and 3 to 8 ft long. Plates on both sides of the drag readily convert it into a

(*Concluded on page* 164)

PRODUCTION STEPPED-UP

STEP 1

AMERICAN INSTALLED

A MOTIVE SANDSLINGER...

...TO RAM LARGE MOLDS—After a thorough study of various foundries and the molding methods used to ram large molds from a great variety of patterns, American decided that the only effective method was a Motive Sandslinger.

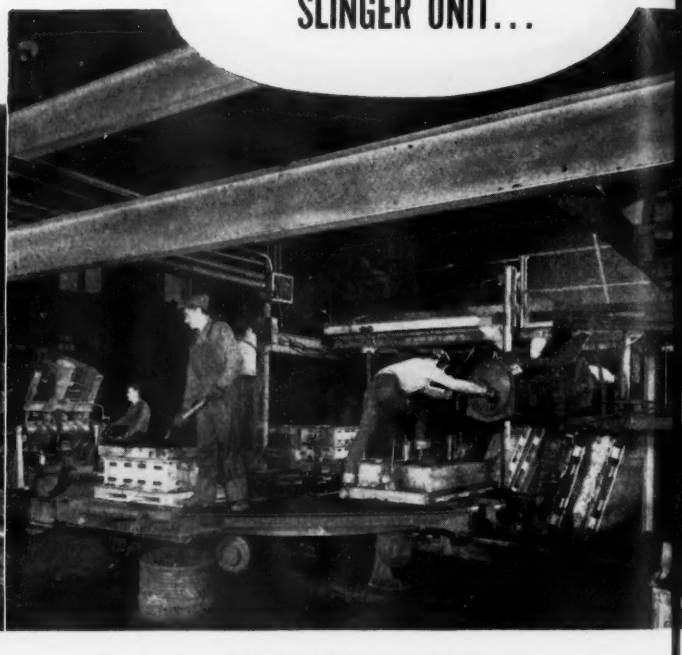
ONCE INSTALLED, THE SLINGER DOUBLED PRODUCTION ON THIS CLASS OF WORK!

STEP 2

THEY INSTALLED

A 4-STATION TURNTABLE

SLINGER UNIT...



...TO RAM MEDIUM SIZE MOLDS—American's experience with the Motive Sandslinger led them to look to the Slinger method for another class of work. They installed a 4-station Turntable Stationary Sandslinger Unit to ram medium sized molds from a large variety of patterns. Pattern changes are made without effort. The men are able to work easily—at good efficiency throughout each shift.

PRODUCTION ON THIS CLASS OF WORK HAS BEEN QUADRUPLED!

The continuous flow of work made possible with a Turntable, combined with the flexibility of operations obtained with a Sandslinger, makes the Turntable-Slinger Unit an indispensable tool for the jobbing foundry. Already accepted as the most efficient method of ramming molds in high production foundries, these units are now finding unlimited application in jobbing foundries.

Read the entire story of foundry operations at American Foundry & Machine Company in September BETTER METHODS. A copy is available to you on request. Write for it now!

SANDSLINGERS AND TURNTABLES

AMERICAN FOUNDRY & MACHINE COMPANY

SALT LAKE CITY, UTAH

STEP 3

THEY INSTALLED AN 8-STATION TURNTABLE

SLINGER UNIT...

...TO RAM SMALLER MOLDS—American was so pleased with the 4-station Slinger Unit that within a short time they installed a second unit . . . this one with 8 stations . . . to ram smaller molds. Here, in many cases, both the cope and drag patterns are mounted on the same board. Thus, the equivalent of 16 molding stations are obtained on one turntable.

FIVE MEN HANDLE ALL OPERATIONS AND THEIR WORK IS FAR EASIER THAN WITH ANY FORMER METHOD!

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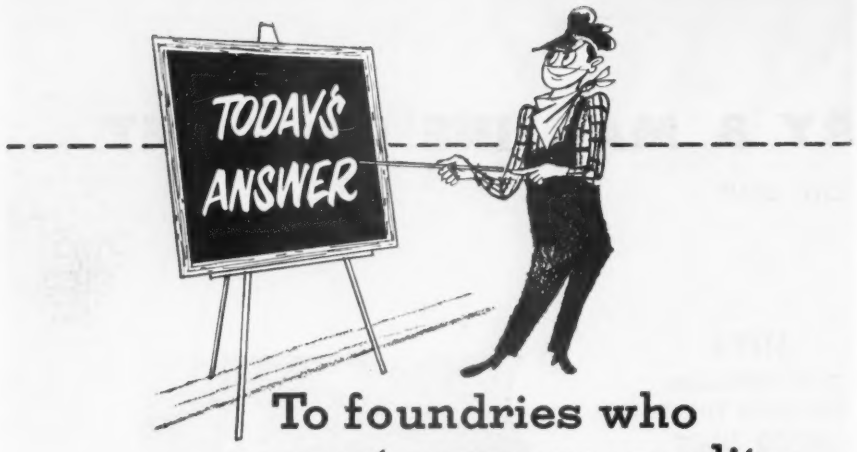

To foundries who must prepare quality sand on the floor

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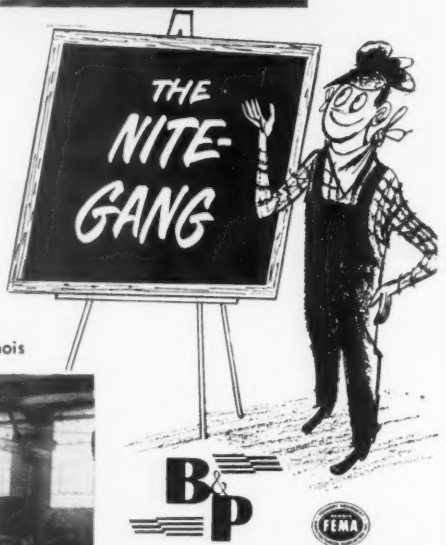

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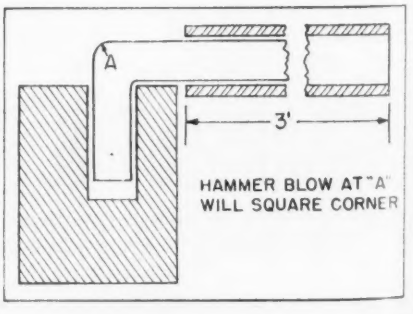
(*Concluded from page* 161)

cheek suitable for many jobs that require to be made in a three-part flask. Neither wooden guides nor nails are needed at the corners.

Driving nails in the joint to prevent shifts, nailing bottom boards to the drags, nailing stacked flasks at the corners to hold them together—all are costly practices and should not be tolerated. Well fitted plates and pins will prevent any shift between cope and drag. A wedgedup clamp under the bottom board will reinforce a weak drag. A strip nailed to two sides or four corners will hold stacked flasks together more satisfactorily than a few nails driven here and there on the joint. After they have served their purpose the strips may be removed and the flasks are as good as ever.

An ample supply of gaggers is needed in the foundry. Good practice does not approve cast iron gaggers. They are easily broken and the stumps are piled in out of the way places until the ubiquitous handyman gathers sand, gaggers, soldiers and other rubbish into his barrow and wheels it out to the dump. A clear waste of good material. The foregoing practice particularly is true when the shop is not equipped with a cinder mill.

Wrought iron or steel gaggers really are the most economical. After they have been bent or twisted they readily may be straightened and will last for several years. When a new supply of gaggers is required a handyman can select a number of short pieces of scrap rods that have accumulated, shear them to a definite length and then bend toes on them. A heavy iron block, 8 x 12 x 24 in., will serve admirably. Several holes, $\frac{5}{16}$, $\frac{9}{16}$ and $\frac{11}{16}$ in. diam drilled to depths 3 to 6 in., will form the toes. A short length of 1-in. pipe slipped over the shank will give the operator sufficient leverage to bend the rod easily. The block is mounted on a pair of horses 24 in. high. Other convenient places in which rods may be bent into gaggers readily will suggest themselves.



Simple equipment for making gaggers

Texas Foundry Conference To Be Oct. 19-20

Technical sessions covering all branches of the foundry industry are scheduled for the second Texas Regional Foundry Conference. The two-day meeting, sponsored by the Texas Chapter and the Texas A & M College Student Chapter of the American Foundrymen's Society, is to be held at the Shamrock Hotel, Houston, Friday and Saturday, Oct. 19-20.

In addition to the technical sessions devoted to individual metals, a general session on sand problems will open the conference Friday morning. Other general sessions will be devoted to materials handling and the shell mold casting process. Luncheon sessions on Friday and Saturday, a Texas barbecue Friday evening, and a banquet Saturday evening will complete the program.

Tentative program follows:

Friday, Oct. 19

8-9:30 a.m.—Registration

10 a.m.-12 noon — General meeting: "Scabs, Buckles and Spalls," by John B. Caine, consultant, Cincinnati. "Sand Control," by Harry W. Dietert, Harry W. Dietert Co., Detroit

12:30-1:45 p.m.—Luncheon Meeting: Walter L. Seelbach, president, Superior Foundry Inc., Cleveland, and national president, American Foundrymen's Society

2-3:20 p.m.—General Meeting: "Flow of Materials in Foundry Bins and Hoppers," by R. L. McIlvaine, National Engineering Co., Chicago

3:40-5 p.m.—Sectional meetings:
Gray Iron: "Cupola Practice for Gray Iron Foundries," T. H. Wilder, Vanadium Corp. of America, Detroit.
Steel: "Foundry Refractories," Ray Witschey, A. P. Green Fire Brick Co., Chicago
Nonferrous: "Application of Some Fundamental Principles to the Melting, Pouring and Casting of Copper Base Alloys," George P. Halliwell, H. Kramer & Co., Chicago

6:30 p.m.—Texas barbecue

Saturday, Oct. 20

9-11:30 a.m.—General meeting: "Shell Mold Casting Process," E. B. Henby, National Engineering Co., Chicago, and J. A. Wickett, Monsanto Chemical Co., Springfield, Mass.

12-3:15 p.m. — Luncheon meeting: Films — "Mechanization in Molding," C. V. Nass, Beardsley & Piper Division, Pettibone Mulliken Corp., Chicago, and "The ADM of Cores," W. B. Bishop, Archer-Daniels-Midland Co., Cleveland

3:30-5 p.m.—Sectional meetings:
Gray Iron: "Basic Cupola Operation," Jack Holt, Basic Refractories Inc., Cleveland
Steel: "Molds and Mold Coatings for Use at Elevated Temperatures," W. H. Peterson, M. A. Bell & Co., St. Louis
Nonferrous: "Insulating Sleeves," Michael Bock, Exomet Inc., Conneaut, O.

7 p.m.—Banquet: Paul Weaver, Gulf Oil Corp., Houston, Tex.—"The Battle of the Metals"

Data for Apprentices Joining Armed Forces

Procedure to be followed by an apprentice and his employer when the apprentice leaves to join the armed forces is presented in an illustrated pamphlet issued by the Bureau of Apprenticeship, U. S. Department of Labor, Washington 25. It explains the records to be prepared for use by an apprentice when reporting for active duty and also for his use when he returns from military service.

Want mulled sand ANYWHERE in the foundry?

Real portability . . only the sand need be moved—not the entire mullor!

Today's answer is the portable MULBARO

Here's how to have mulled sand readily available in *any* location in the foundry. Use a Mulbaro . . *today's answer* to small foundries for *all* their mulling . . . to large foundries for mulling special batches of facing and core sand and for mixing ladle lining and cupola patching material.

The Mulbaro mulls *thoroughly!* It requires *less* sand handling! It provides real portability at lowest cost.

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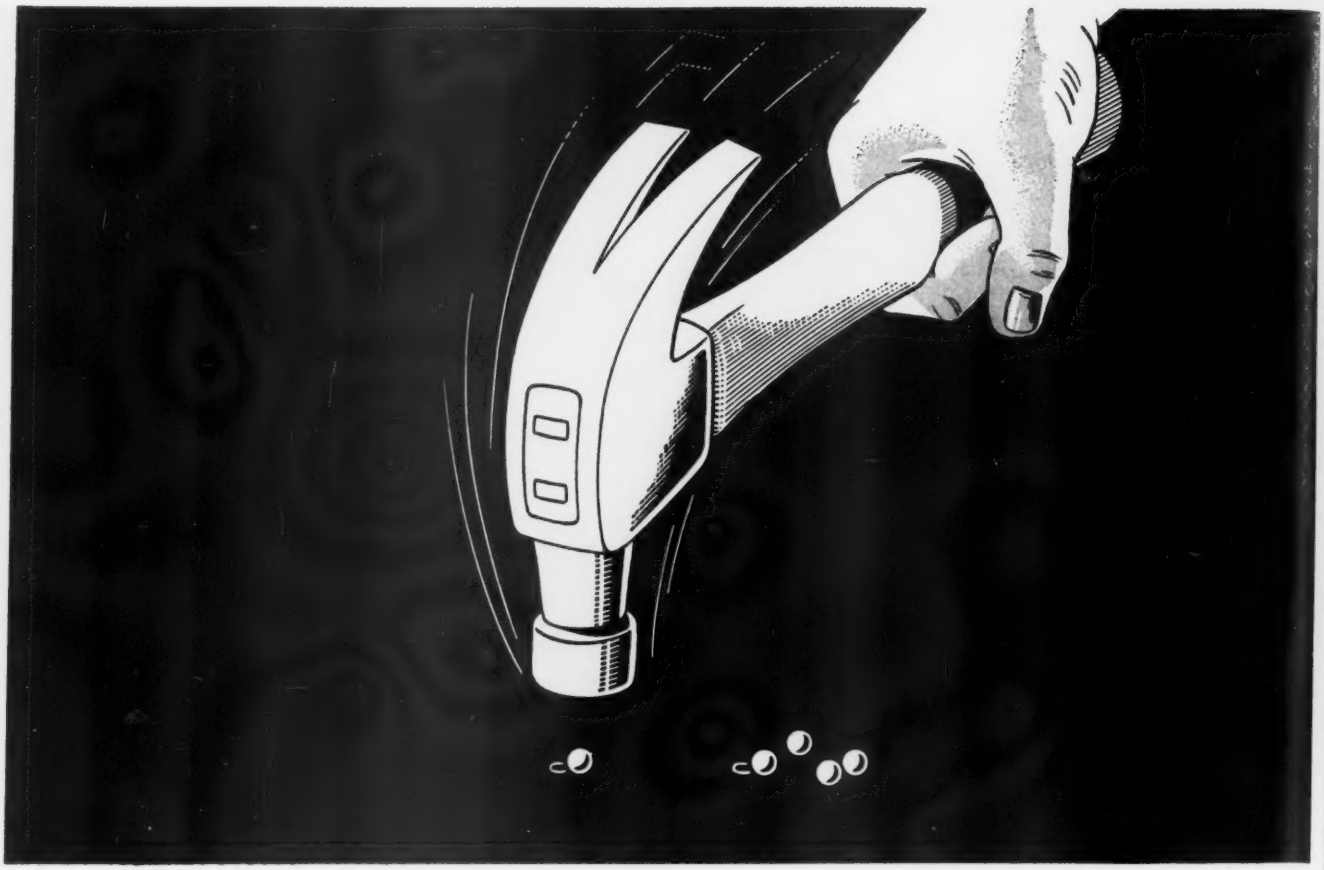

ARE YOU A *Betting Man?*

We would like to bet you a good lunch—that you can't take five pellets of the chilled iron shot you are now using and deform them, no matter how lightly you tap with your hammer. ALL OF THEM WILL SHATTER—NONE OF THEM WILL DEFORM.

Then we'd like to bet you another lunch that you can take five pellets of National Controlled "T" Shot and EVERY ONE OF THEM WILL DEFORM BEFORE TEARING APART.

The significance of these statements is obvious. National Controlled "T" Shot and Grit is the ONLY chilled iron abrasive in which the hard iron carbides (that do the cutting) are imbedded in a *ductile matrix*. Hard? Yes, indeed, hard enough to do a cleaning job as fast or faster, BUT soft enough to go easy on your equipment and to keep the shot from shattering as readily.

As a betting man, we'd like to prove our statements to you. The most you can lose is a lunch. And if we're telling the truth, you can gain substantial savings in your cleaning operations. What we suggest is such a quick and simple test, you can make it in a matter of minutes. Incidentally, if your blastcleaning operation requires the use of grit you will not be able to make this test—but remember, grit is made from shot, and a ductile matrix is even more important to a grit user, from a standpoint of holding down maintenance costs. Please write your name and address on the coupon below and mail it to the nearest Hickman-Williams office, and let us show you something *different* in chilled iron shot and grit.

NATIONAL CONTROLLED "T" SHOT AND GRIT *IS PRODUCED EXCLUSIVELY BY*
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MAIL TO HICKMAN, WILLIAMS OFFICE NEAREST YOU

Preparing a mold for casting one of the pie-shaped segments of the saucer at the Cleveland foundry of the Aluminum Co. of America

This large pattern was used in molding the saucer parts

CAST ALUMINUM SAUCER

Used in Radio Research

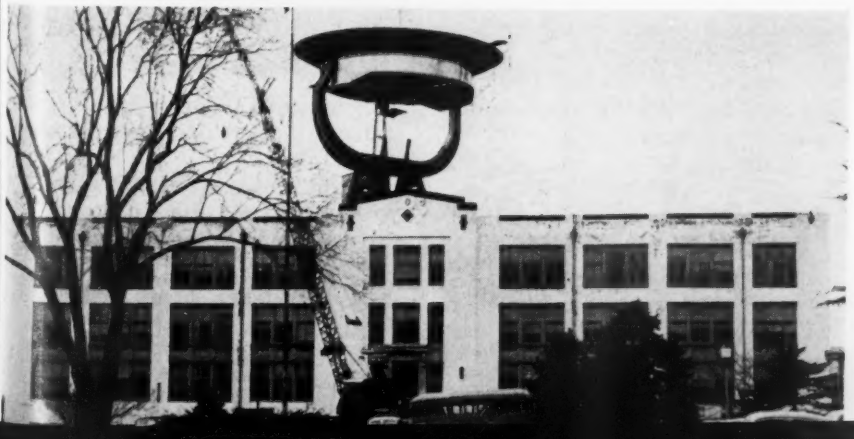
Lowering one of the segments in place for final assembly

THE largest cast aluminum saucer ever made, 50 feet in diameter, now is mounted on top of one of the buildings at the Naval Research Laboratory, Washington. There it serves a far different purpose than its small counterpart in china. Essentially, it's an oversized optical telescope, except that it deals with radio waves instead of light in the Navy's program of radio astronomy.

According to the *Alcoa Aluminum News-Letter*, through whose courtesy this article is reproduced, Navy scientists predict the unit will be able to bounce radio waves off the moon which can be picked up in distant parts of the earth. It will also provide valuable data for long-range weather forecasting.

Pie-shaped sections of the saucer were cast by the Aluminum Co. of America at its Cleveland foundry and shipped to the Collins Radio Co., Cedar Rapids, Iowa, for finishing and assembly. So big that the fabfricator's plant could not accommodate it, the saucer was covered with a 34-foot high tent and all machining and polishing was carried on there with a specially designed boring mill. The unit then was disassembled and shipped sectionally to Washington where it was assembled and mounted on the roof.

The complete telescope weighs approximately 50 tons, including 30 tons of aluminum parts and a 20-ton mounting yoke.



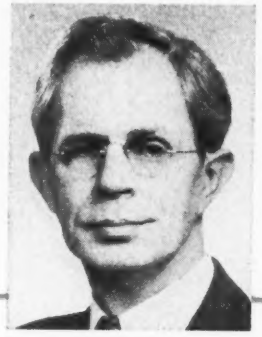
The 50-ft-diam radio telescope as it appears on a building roof at the Naval Research Laboratory

MAN-TO-MAN

on the Molder's Bench

"Getting the Low-down"

By RALPH L. LEE



JUST before supper time the other day the phone rang and, without the usual "guess-who-this-is" routine, a very special foundry friend of mine bluntly announced that he was in town and coming right out. I started to tell him that it was about time he paid me a visit, but he hung up on me—that's the kind of a cookie he is.

Even if I had planned on doing something this particular evening I would have gladly cancelled the arrangements, for I had been wanting to get ahold of this fellow for quite some time. John is one of those people who seem to have been born with an irresistable urge to cut through the if's, and's and but's usually befogging the issues of the day, and come through with the low-down —at least one that satisfies them.

Being sort of a half-baked inventor myself, I am always hopped up on the new things coming out, like nodular iron, investment molding, the shell molding process, high-frequency core baking, preheated blast air, dehydrated blast air—in fact, almost fanatically interested in everything and anything, whether new or old, showing promise of giving this industry of ours a boost.

Maybe it's because I'm just an amateur, but I seem to have one heck of a time trying to get the hard facts on how these new things are actually working out in practice on the job. I'll talk to some folks who are tops in their branch of the craft about some development and they'll be all for it. Then right across the alley, so to speak, I'll find some other kingpins in another branch who are dead set against it. So with an unusually heavy inventory of these 'tis and 'tain't questions on board I was all excited over the chance of sitting down with John and running over the list for his particular brand of low-downs.

After a pot-luck supper which Mother (that's my home superintendent, vice president in charge) served without even the slightest hint as to why he hadn't let us know he was coming, we went up to the Lee Hobby Foundry and the fun began.

He had just returned from a trip all over creation and back chasing down these closed-circuit cupolas—the ones that work like blast furnaces. He was for them and their future. On the same trip he did some checking on the nodular iron situation, but he couldn't get the dope he needed to issue a verdict; he concluded that he hadn't been to the right places. He had no question as to the future of high-frequency core baking; it was in the bag as far as he was concerned. He expressed himself rather explosively on the unnecessary mystery a lot of misguided souls had built up around molding sand and core sand bonds and mixes. I was surprised to find that he hadn't paid any attention to shell molding.

I must say that it was quite a treat to hear this fellow tick off his answers to questions being argued back and forth all over the country. They came so thick and fast I had all I could do to grasp the subjects, let lone check them against my meager experience and findings.

While I didn't get as many questions settled as I would have liked to, I did begin to get a hunch as to why it is possible for so many recognized authorities to have such contradictory opinions on a given subject. John had spent most of his life in a great big high-production foundry. Everything he looked at he saw through the lenses of specs ground by continuous production of long-run items in tremendous quantities.

There is no doubt in my mind that answers to the very same questions another equally successful friend of mine would have given me would have been different. This other fellow has spent most of his life in a foundry making a wider variety of castings in every conceivable size and quantity on a hop, skip and run basis with high peaks and low valleys in the tonnage curve.

In the light of these two different viewpoints it dawns on me that it isn't the least bit surprising that opinions regarding new developments should vary with background, peculiar needs and experience. And right here a warning signal pokes its head up through this brainstorm against getting hypnotized with the glamour, novelty and romance of some new wrinkle—of swallowing it hook, line, bait, sinker and all on the basis of keeping up with the Joneses in following the fad. From what I see as I go around, most foundries have at least a few monuments to this folly gathering dust in some dark corner.

As a result of John's visit and the thinking I've done about it since, it begins to look as though it's downright silly for me to even try to find the low-down on any development which would be universally acceptable. It begins to look as though the situation of the appraiser is just as important to the appraisal as the features and qualities of the development itself. So any new thing is bound to mean different things to different people.

This being the case, it occurred to me that before we try to get the true facts on a piece of apparatus or process it might be a good idea if we spotted our own situation on the industry map in the following categories:

1. Short runs of widely varying patterns in small and irregular quantities.

2. Long runs at varying rates and intervals of a few more or less standard items plus a wide variety of this and that.

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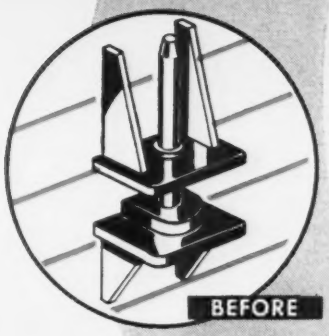

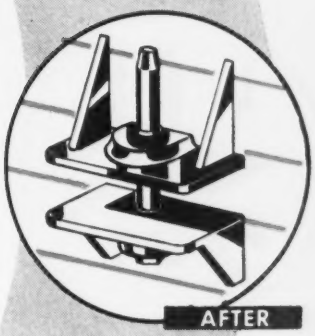

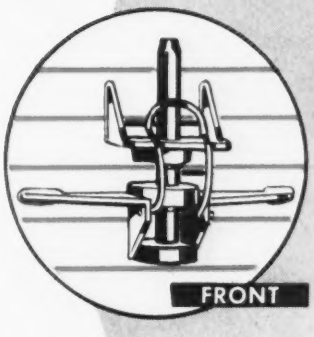

RESEARCH

that wears work gloves

Time and money-saving ideas don't always come from BS&B's ever-busy laboratories. The foundrywise workers who make BS&B Flasks developed these.

To provide more finger room and easier handling, note the new pinlug arrangement pictured at right above. Smooth, flat surface makes easier handling at the parting line of lightweight, one-man flasks.

Clamping spring (below) provides an automatic push-off arm for continuous line shakeout use. Both new features are optional . . . typical of BS&B's understanding of foundry problems, big and little.

BS&B

Fabricated Steel

FOUNDRY FLASKS

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Send full details about the new BS&B Pinlug and Clamp spring. ☐ Also send the famous BS&B "Foundry Flask Bible", the industry's most complete catalog, guidebook and data source. ☐ Have sales representative call.

NAME_____ TITLE_____

FIRM_____

STREET_____

CITY_____ STATE_____

(*Concluded from page* 168)

3. Steady, large quantity production of a relatively few items.

Then, with the angle from which we view the subject at hand established, we can look at it with these questions in mind:

1. Does the darned thing really work?

2. Will it stay working and for how long?

3. Does it do something we couldn't do before? (what will we do with what it does?)

4. Does it do something we're doing now better in the same time?

5. Does it do the same thing we're doing now only faster?

6. What is the cost per hour of having it around? (working or not)

7. What is the dollar advantage in terms of improved quality or increased quantity?

8. Is the difference between the gain in dollars minus the cost of having it around great enough to pay for the man-hours required to sell it to the gang and change the routine.

9. Is the most conservative estimate of reasonably assured orders ahead great enough to keep the proposition out of the straight gamble category.

I guess I've gone and let myself get carried away with this new development appraisal business. I imagine the guide I've cooked up here will be kid stuff to the old timers. But I'll say this that, as an amateur running the low-tonnage Lee Hobby Foundry, it explains why all foundrymen can't get together on any given subject at any given time or place.

I'm going to make me a pair of "Economics Specs" with lenses ground according to the specifications covered in my list. Then I'm going to put these specs on while sizing up some new development so I won't be blinded by its novelty or the current ballyhoo making the rounds about it.

Book Review

Electroplating by J. P. Mohler and H. J. Sedusky, cloth, 257 pages, 5½ x 8½ inches, published by Chemical Publishing Co. Inc., New York. Price $5.

Without going into involved details of electrochemical theory this book discusses the important aspects of practical electroplating. Necessary fundamentals are presented in nontechnical language so as to be understandable by electroplaters without technical background. Characteristics of plating baths, behavior of electric current, the deposit, bath compositions, control methods and analytical procedures are covered. Special chapters are devoted to alloy plating, continuous plating, diffusion coatings, and copper plating for selective carburization. One chapter of 29 pages relates to frequently encountered plating bath troubles, their causes and procedures for avoiding them.

Meetings of Interest to Foundrymen

Oct. 5-6—Northwest Regional Foundry Conference, Washington, British Columbia, Oregon, and Oregon State student chapter, AFS, Vancouver, B. C., Canada

Oct. 8-12—National Safety Council, congress and exposition, Chicago

Oct. 11-12—Michigan Regional Foundry Conference, Michigan State College, East Lansing, Mich., sponsored by Michigan chapters, AFS, and the college.

Oct. 15-19—American Society for Metals, annual meeting and exhibit, Michigan State Fair Grounds, Detroit.

Oct. 19-20—New England Foundry Conference, MIT, Cambridge, Mass.

Oct. 19-20—Texas Regional Foundry Conference, Texas Chapter of the AFS, Shamrock Hotel, Houston, Tex.

Oct. 25-26—Gray Iron Founders' Society, annual meeting, Edgewater Beach Hotel, Chicago

Oct. 26—Malleable Founders' Society, western sectional meeting, Drake Hotel, Chicago

Oct. 31-Nov. 2—Foundry Equipment Manufacturers' Association, annual meeting, Homestead, Hot Springs, Va.

Nov. 1-2—Metals Casting Conference, sponsored by Purdue University with Michiana and Central Indiana AFS chapters, Purdue University, West Lafayette, Ind.

Nov. 1-2—Industrial Management Society, annual time and motion study and management clinic, Sheraton Hotel, Chicago

Nov. 2—Malleable Founders' Society, eastern sectional meeting, Commodore Hotel, New York

Nov. 7-9—Meehanite Casting Manufacturers, annual meeting, New Yorker, New York

Nov. 7-9—National Foundry Association, annual meeting, Shoreham Hotel, Washington

Nov. 8-9—Quad City Regional Foundry Conference, Blackhawk Hotel, Davenport, Iowa

Nov. 8-10—Steel Founders' Society of America, Technical and operating Conference, Carter Hotel Cleveland

Nov. 15-16—Magnesium Association, annual meeting. Biltmore Hotel, New York

Nov. 19-20—National Metal Trades Association, annual convention, Palmer House, Chicago

Nov. 26-Dec. 1—Chemical Industries Exposition, Grand Central Palace, New York

Nov. 30—Malleable Founders' Society, western sectional meeting, Drake Hotel, Chicago

Dec. 6-8—American Institute of Mining and Metallurgical Engineers, Electric Furnace Steel Conference, Hotel William Penn, Pittsburgh

Dec. 10-15—Spanish Iron & Steel Institute, general assembly, Madrid, Spain

1952

Jan. 17-19—California Regional Foundry Conference, Northern and Southern California Chapter, AFS, San Francisco

Jan. 18—Malleable Founders' Society, semi-annual meeting, Hotel Cleveland, Cleveland

Feb. 7-8 — Wisconsin Regional Foundry Conference, Wisconsin Chapter, AFS, and University of Wisconsin, Hotel Schroeder, Milwaukee

Feb. 21-22—Birmingham Regional Foundry Conference, Birmingham District Chapter and University of Alabama student Chapter, AFS, Tutwiler Hotel, Birmingham

Feb. 22—Malleable Founders' Society, western sectional meeting, Drake Hotel, Chicago

Mar. 3-7—American Society for Testing Materials, spring meeting, Statler Hotel, Cleveland

Mar. 7—Malleable Founders' Society, eastern sectional meeting, Commodore Hotel, New York

Mar. 28—Malleable Founders' Society, western sectional meeting, Drake Hotel, Chicago

Apr. 25—Malleable Founders' Society, western sectional meeting, Drake Hotel, Chicago

May 1-7 — American Foundrymen's Society, annual convention, Atlantic City, N. J.

May 16—Malleable Founders' Society, eastern sectional meeting, Commodore Hotel New York

May 23—Malleable Founders' Society, western sectional meeting, Drake Hotel, Chicago

June 16-17—Malleable Founders' Society, annual meeting, Homestead, Hot Springs, Va.

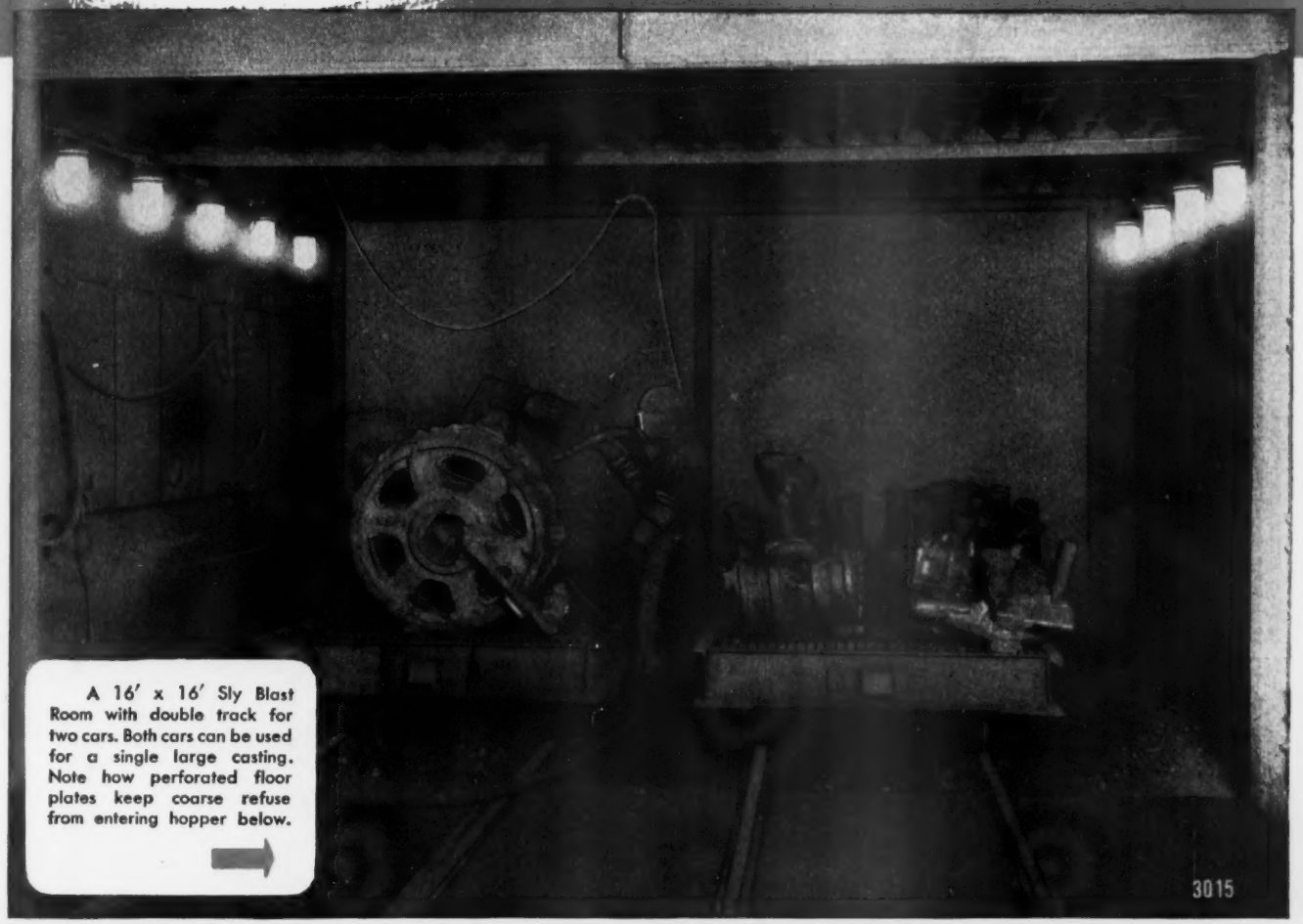
June 23-27—American Society for Testing Materials, annual meeting, Statler Hotel, New York

July 25—Malleable Founders' Society, western sectional meeting, Drake Hotel, Chicago

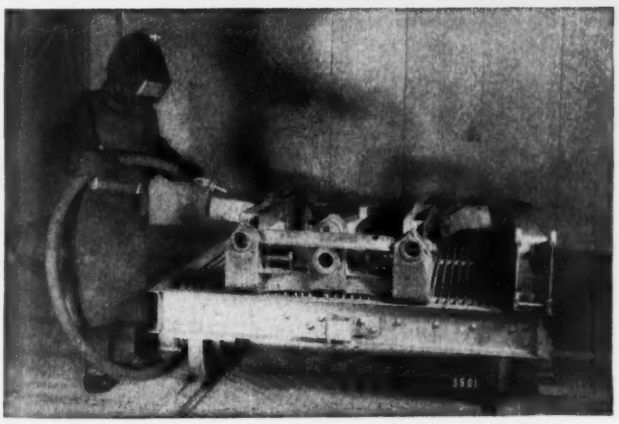
Oct. 16-17—Gray Iron Founders' Society, annual meeting, Hotel Cleveland, Cleveland

SLY

ARMOURED* BLAST ROOMS



A 16′ x 16′ Sly Blast Room with double track for two cars. Both cars can be used for a single large casting. Note how perforated floor plates keep coarse refuse from entering hopper below.



This view shows a Sly Blast Car in a Sly Blast Room. Perforated floor plates are supported by grating preventing plates from warping. Observe how tops of rails are flush with floor. Operator wears a Sly "Purair" Helmet.

Whatever Size Your Castings

And whatever your tonnage we have a standard blast room to suit. W have built blast room equipment for the cleaning of the inside of tar cars, for large airplane fuselages, for structural assemblies, tanks, railroc cars and locomotives. Some large blast rooms are self-contained building

Standard Sly Blast Rooms

Inside Width: 8 ft., 10 ft., 12 ft., 14 ft., 16 ft.
Inside Length: 8 ft., 10 ft., 12 ft., 14 ft., 16 ft.
Inside Height: 7 ft. 3 in., 8 ft. 3 in., 9 ft. 3 in.
Larger Blast Rooms for special purposes.

* **ARMOURED** — **An extra layer of detachable 3/16″ steel wear plates to protect the walls.**
An extra layer of steel grating to reinforce the floor against sagging.
(Exclusive Sly features)

THE W. W. SLY MANUFACTURING CO.

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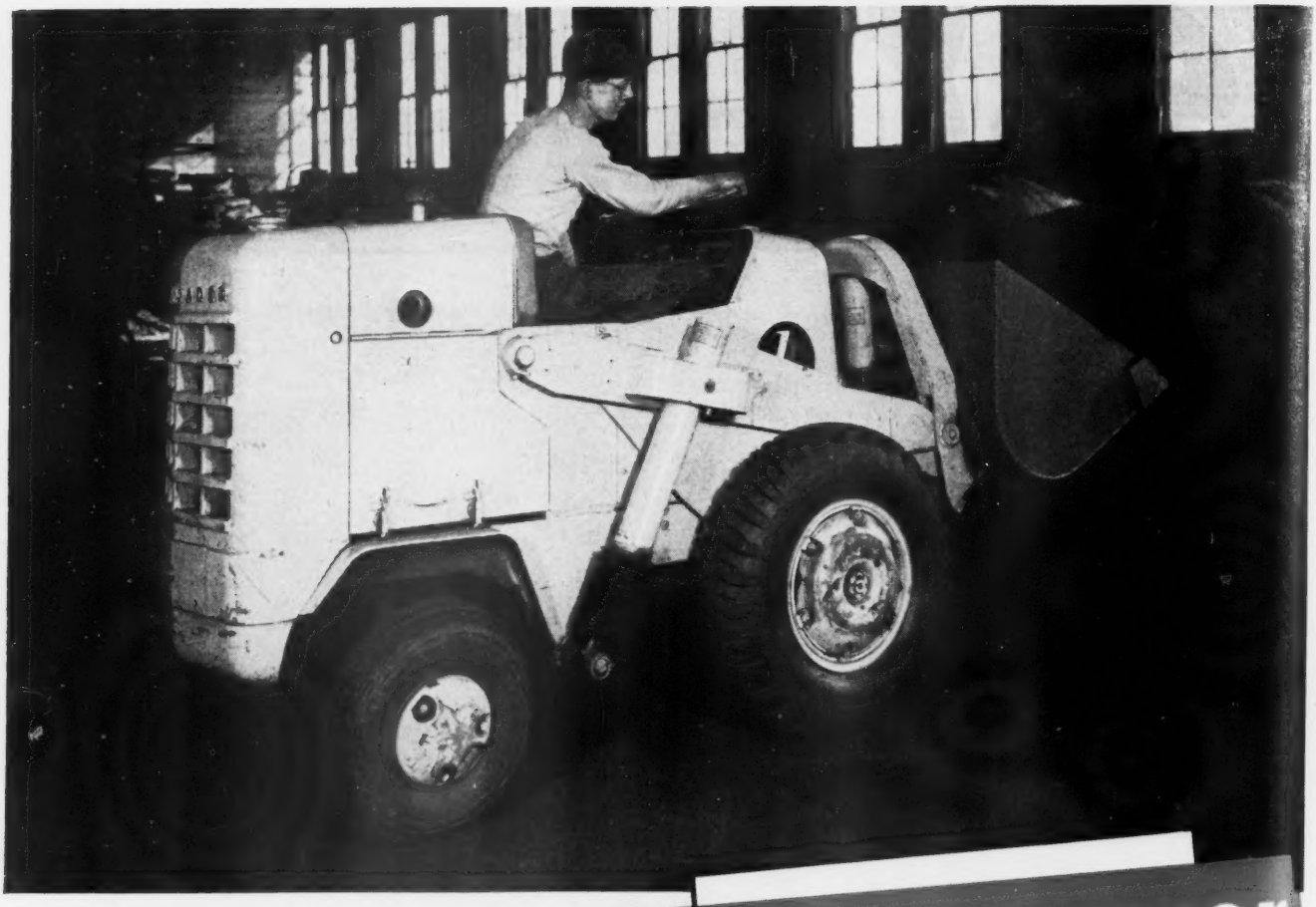


mechanize your manpower

Take the shovel out of a man's hand and put him on the seat of a PAYLOADER. He'll show you how to lick rising costs, how to increase output and solve manpower shortages. Hundreds of foundries and metal working plants have taken this step with highly gratifying results. And PAYLOADERS can do so many jobs that there is hardly any limit to their usefulness.

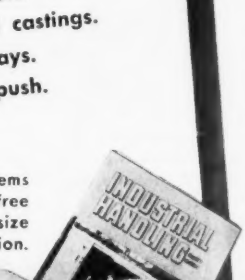
Every PAYLOADER is a complete Hough-built tractor-shovel specifically designed with multiple reverse speeds and other features that insure fast, low-cost bulk material handling. There are several sizes from the 12 cu. ft. Model HA shown, up to 1½ cu. yd. bucket capacity. They are also available in front-wheel, rear-wheel and four-wheel-drive models.

Every PAYLOADER is backed by 30 years of material handling equipment manufacture and a Hough Distributor with complete parts and service facilities. The Frank G. Hough Co., 703 Sunnyside Avenue, Libertyville, Illinois.

On These Jobs

- Unload box cars.
- Carry sand, coke, scrap, limestone, etc., to storage.
- Transport and distribute sand to molding stations.
- Remove used sand from floors.
- Windrow sand for the cutter.
- Charge mullers, hoppers, tumbling barrels.
- Feed conveyors, elevators, mixers, screenerators.
- Clean up gangways, aisles and other areas.
- Handle coal, ashes, cinders.
- Handle scrap and small castings.
- Maintain private roadways.
- Do cranework — haul, push.
- Remove snow.

HELP for your material handling problems is found in "Industrial Handling" the free Hough magazine. Catalog on any size PAYLOADER is available, without obligation.



SAY "HUFF"

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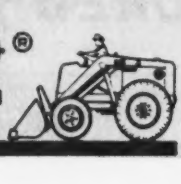
THE FRANK G. HOUGH CO. • *Since 1920*



Industry BRIEFS

FRANKLIN Pattern & Casting Co., incorporated in 1948 to produce patterns and nonferrous castings on a contract basis, recently constructed and occupied a plant at 9300 Park Ave., Franklin Park, Ill. Walter B. Winkoff, company president, formerly was associated with Howard Foundry Co., Chicago. Franz Petersen, general manager, also is a former Howard Foundry employee.

* * *

Moto-Truc Co., 1953 East 59th St., Cleveland, is constructing an addition to its present factory there, which will enlarge its production and plant facilities by an increase of about 40 per cent in building footage. New loading and unloading docks and enclosed parking lot have been added. Paul F. Schreck is president of the company.

* * *

Park Chemical Co., Detroit, has appointed the following sales representatives for its Heat Treating Division: A. T. Ridinger and Lawrence Ridinger, Industrial Electro-Gas Equipment Co., 2944 27th Ave. S., Minneapolis; M. K. Griggs and B. W. Wallen of M. K. Griggs Co., 2801 San Jacinto, Houston 4, Tex., and Hugo W. Hiemke, California Alloy Products Co., 1608 Camden Parkway, S. Pasadena, Calif.

* * *

General Metals Corp., subsidiary of Transamerica Corp., San Francisco, has taken over from Rockwell Mfg. Co., Pittsburgh, the malleable iron pipe business of Pittsburgh Valve & Fittings Corp., Barberton, O., and will transfer equipment, tools, and inventory of the business to its San Francisco and Los Angeles Pacific Fittings Division.

* * *

Cleco Division, Reed Roller Bit Co., Houston, Tex., manufacturer of air tools and accessories, has appointed Elect Air Tool Co., 310 West Verdugo Ave., Burbank, Calif., and W. E. Mushet Co., 725 Bryant St., San Francisco 7, as distributors.

* * *

California Pipe & Fitting Foundry, Taft, Calif., has been sold to Antonio Quinero of Manila, P.I. Plant and equipment have been dismantled and shipped to Manila, where it will be the first unit of a $10 million soil pipe, fitting, and cast iron foundry.

* * *

Sterling Wheelbarrow Co., Milwaukee 14, has moved its Metropolitan Office from New York to 389 Main St., Hackensack, N. J.

* * *

A & A Foundries Inc., Arnold Jahn, owner, has purchased Lindenhurst Foundry Inc., 72 East Hoffman Ave., Lindenhurst, N. Y. Mr. Jahn also owns A & A Aluminum & Brass Foundry, 473 West Broadway, New York.

* * *

Columbian Vise & Mfg. Co., 9021 Bessemer St., Cleveland, has acquired the E. A. Stevens Level Co., Newton Falls, O., which will be operated there as the Stevens Level Division of the parent company.

* * *

Ampco Metal Inc., 1745 South 38th St., Milwaukee 15, has appointed R. J. Greer Equipment Co., 116 South Salina St., Syracuse, N. Y. as distributor for Ampco electrodes in New York, exclusive of New York city.

* * *

Toledo Scale Co., Toledo, O., this year is celebrating its 50th anniversary with a series of events throughout the year, highlighted by meetings of the company's Quarter Century Club made up of employees with 25 years or more service.

* * *

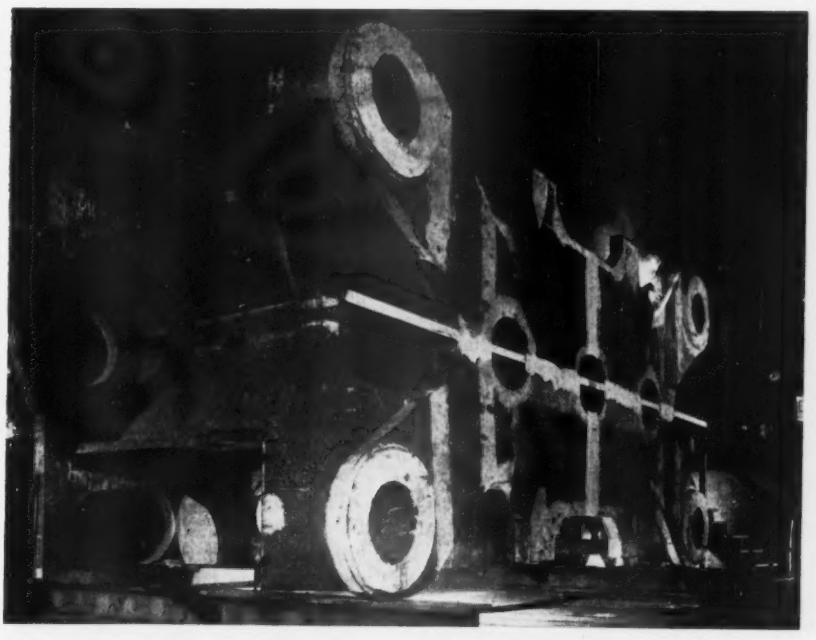
Electro Metallurgical Co.'s new ferroalloy plant at Marietta, O., has started production although not yet completed. Two of four 40,000-kw turbine and generator units are installed and the other two are expected to be in by early 1953.

* * *

Noble & Sons Foundry, Tennessee, Ill., has discontinued operations. However, a new organization, Iron-Clad Foundry, directed by Keith King, has acquired the building and is continuing casting operations there.

* * *

Swartwout Co., Cleveland, has established a company office in the M & M Bldg., Houston, Tex., to house



BIG JOB: Crown for an 8000-ton, triple-action hydraulic press shown resting on its side at the Bethlehem, Pa., plant of Bethlehem Steel Co., is 29 ft long, 12 ft 10 in. wide, and over 9 ft high. It is made of rolled steel plates and castings, about 6 in. thick, welded together. The metal was preheated with gas burners to avoid cooling strains after welding. Photo furnished through courtesy of Bethlehem Steel Co.

its steam specialties and roof ventilator divisions. William A. Sharp has been placed in charge of ventilator sales engineering and service. J. B. Downey will handle steam specialties division activities. Howard T. Reiley will continue to represent both divisions in the territory.

* * *

Watertown Grey Iron Foundry Inc., Watertown, Wis., has been formed to manufacture iron, brass, aluminum and other metal products. Incorporators are R. H. and Ethel Stephenson and Leonard M. Haines.

* * *

Simonds Abrasive Co., Philadelphia, has National Production Authority approval for a program of new production facilities to manufacture vitrified and resinoid bonded grinding wheels.

* * *

American Brake Shoe Co., New York, will erect a $1 million foundry on the outskirts of Medina, N. Y. Foundry will be ready for operation in the spring and will produce jet engine parts.

* * *

Wendt-Sonis Co., Hannibal, Mo., maker of carbide-tipped cutting tools, is enlarging its plant and productive capacity in a $300,000 expansion program.

* * *

Worthington Pump & Machinery Corp., Harrison, N. J., has opened a branch office at 506 Hall Bldg., Harrisburg, Pa. The office is in charge of A. L. Mays and is a branch of Worthington's Philadelphia office.

* * *

Cleveland Foundry & Mfg. Co., 405 East 27th St., Cleveland, Tenn., is the new name of the former Co-Operative Foundry Co. There is no change in ownership, management, or operation.

* * *

General Refractories Co., Philadelphia, has opened its newly constructed sales warehouse at 4242 West 45th St., Chicago. Roger W. Braden is warehouse manager.

* * *

Hall Foundries Inc. has leased the Ferro Pipe plant on Elm St., Bridgeton, N. J. Dr. A. Hall Rosenbaum is Hall Foundries president. Abe Sklar is works manager.

* * *

Busch-Sulzer Bros. Div., Nordberg Mfg. Co., 3300 South Second St., St. Louis 18, plans construction of a $400,000 foundry addition and storage building.

* * *

The sand school conducted Aug. 20-23 by Frank S. Brewster, Harry W. Dietert Co., Detroit, drew 135 foundrymen from 14 states and Canada.

* * *

Hardinge Mfg. Co., 240 East Arch St., York, Pa., has contracted with Meehanite Metal Corp., New Rochelle, N. Y., to produce castings by the Meehanite process.

Michigan Conference To Be Held Oct. 11-12

Michigan State College, East Lansing, Mich., again will be the site of the annual Michigan Regional Foundry Conference, Thursday and Friday, Oct. 11-12.

This 19th in the series of conferences sponsored by the school in cooperation with Michigan chapters of the American Foundrymen's Society, will have four general discussion topics. These subjects, each of which will be treated by several speakers, are: "Foundry Education in the Secondary Schools," "Dimensional Accuracy in Castings," "Foundry Sands" and "Quality Control in the Foundry."

The conference will open Thursday at 9:30 a.m., and the morning session will be devoted to educational subjects. The afternoon session will cover shell molding, plaster mold castings and precision castings. Friday will be given over to the subjects of sand and quality control.

New Hamilton Publication

Hamilton Foundry & Machine Co., Hamilton, O., has recently published an attractive, 48-page booklet, "Hamilton Quality Castings," describing in considerable detail the wide range of gray iron and Meehanite iron castings it produces. The publication also incorporates a historical review of the company as well as a brief description of the iron casting process.

The Characteristic Odor of Nodular Iron Fractures and Carbide Slags

By B. F. BROWN, *Research Associate*
North Carolina State College, Raleigh, N. C.

THE pungent odor which characterizes freshly fractured nodular iron (and to a lesser extent Meehanite gray cast iron) has on occasions raised speculations in technical discussions about the existence of carbides of some sort in these irons—carbides which would hydrolyze to give this odor.

Such speculations stem from the presumption that the odor is that of acetylene, which can be prepared by the hydrolysis of some carbides. It has long been known, however, that acetylene, when pure, has only a faint odor and that is a "pleasant ether-like" one.[1] The strong unpleasant odor is caused by traces of phosphine (PH_3) and, to a lesser extent, of hydrogen sulphide.

A hydrolyzable phosphide is formed in nodular iron presumably by direct reaction of magnesium (or other elements) with sulphur:

$$3\,Mg + 2\,P \rightarrow Mg_3P_2$$

This Mg_3P_2 presumably constitutes the dark inclusions in nodular iron which apparently are decomposed by water.[2] When these inclusions are exposed by fracturing the metal, they react with the moisture of the air to give the pungent odor of phosphine:

$$Mg_3P_2 + 6\,H_2O \rightarrow 3\,Mg(OH)_2 + 2\,PH_3$$

Calcium phosphide in calcium-treated irons probably forms and hydrolyzes similarly to magnesium phosphide, but the extent of the formation reaction appears to be limited by the very restricted solubility of calcium in iron:

$$3\,Ca + 2\,P \rightarrow Ca_3P_2;$$
$$Ca_3P_2 + 6\,H_2O \rightarrow 3\,Ca(OH)_2 + 2\,PH_3$$

The calcium phosphide in carbide slags is formed by the reaction:

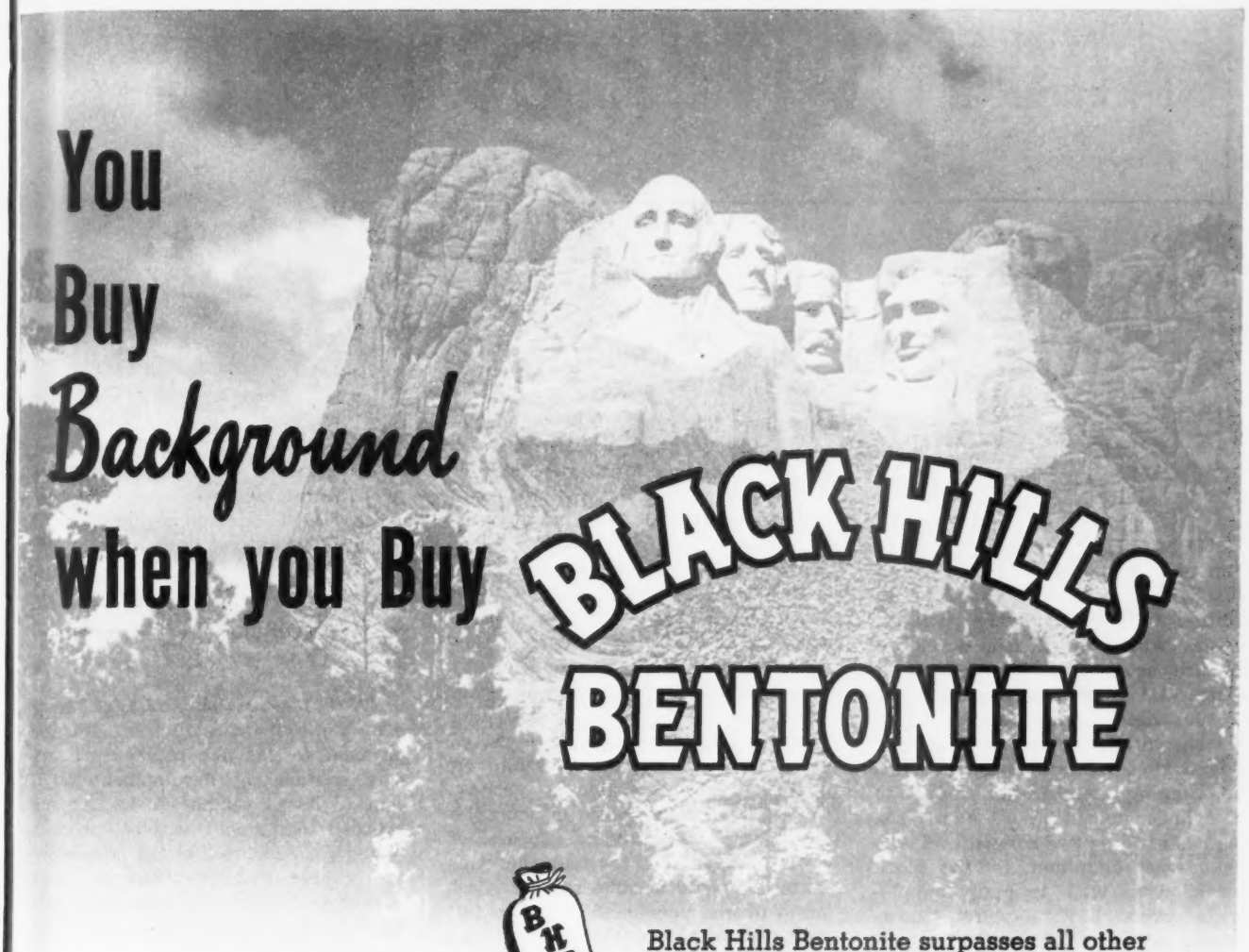
$$Ca_3(PO_4)_2 + 8\,C \rightarrow Ca_3P_2 + 8\,CO$$

Undoubtedly, some hydrogen sulphide may be formed both in irons and slags by hydrolysis of a light-metal sulphide, e.g.:

$$CaS + 2\,H_2O \rightarrow H_2S + Ca(OH)_2$$

The phosphides and sulphides of iron and of manganese, like those of most heavy or noble metals, do not hydrolyze to give phosphine and hydrogen sulphide. Hence the fractures of ordinary irons, even if high in phosphorus and sulphur, do not smell of phosphine and hydrogen sulphide.

1. See for example *Beilsteins Handbuch der Organischen Chemie*, Berlin: Julius Springer (1938), or Meyer & Jacobson: *Lehrbuch der Organischen Chemie*, Leipzig: Van Zeit (1908)
2. J. E. Rehder: "An Introduction to the Annealing of Nodular Iron," *Transactions*, AFS 58, 298 (1950)



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Black Hills Bentonite surpasses all other bond clays in resilience. It excels all other clays in dry strength. Combining high hot strength and high permeability, it surpasses all other clays in this two-fold respect. But—

Instead of enlarging upon the value of these virtues, suppose we emphasize the experience behind every bag of Black Hills Bentonite. *We recommend it to you only if it fits your job best.* This we can do disinterestedly, because we make and market a complete line of bonding clays and do not need to force the same product into every situation. You may rely 100% on the counsel our research and service departments offer you.

Yes, sir, when you buy Black Hills Bentonite, you buy background worth much to you. Yet Black Hills costs not a cent more!

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For patching cupolas enduringly and at a great saving, investigate Cupoline, a remarkable refractory, and Bondactor, as remarkable a machine for applying Cupoline. You can't top this combination.

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AROUND THE COUNTRY

News Reports from • • •

INTEREST by automakers in all-aluminum engines is giving iron foundrymen cause for thought. In addition to two extremely powerful engines which Buick has developed and are being used in two experimental GM cars—Le Sabre and the XP-300—Kaiser-Frazer is also experimenting with a number of aluminum alloy engines in various horsepowers and ranging from in-line four and six cylinder jobs to V-6's and V-8's. Engines of these two companies make use of cast aluminum for the block and head as well as many supplemental parts. K-F's research has as its goal a weight saving in the engine of over 50 per cent and substantial gains in performance and fuel economy.

Business conditions have become extremely spotty in this area. Captive gray iron automotive foundries are pouring at a reasonably steady rate but in a few cases have reduced their melt by as much as 40 per cent. Independent production shops serving the automotive industry for the most part have felt the brunt of the decline in automotive production. One large melter is understood to be casting only one-third the number of blocks it did at this time last year.

Nonferrous shops report their volume is good or bad depending on who their customers are. Some brass shops making valves and fixtures for industrial use were pressed hard by customers earlier this year but now are hopeful that Navy orders will start coming through in quantity before their backlog disappears. Household plumbing, heating and appliance casters are feeling the effects of the cutback in home building and realize that part of their recent business has been at the expense of future volume.

Steel foundries are the busiest of the lot, and those whose specialty is high alloy have taken orders in about five times the quantity offered a year ago. Most of this business is defense-supporting, although a substantial part is for the military directly, particularly the aircraft program. Primary problem for these casters is an adequate supply of alloys, with molybdenum being the most critical at the moment. Nickel shortage continues to plague these producers.

Materials supply problems for gray iron shops are less serious. Although supply of pig iron has been restricted on occasion throughout the summer, melters have been able to get by. Coke shortage has eased measurably, the result principally, it appears, of a disappearance of the fear that this material would become scarcer. Cast scrap of mediocre quality was in full demand throughout the summer, and one or two big users have told their suppliers they will continue out of the market until next year. Results of the scrap drive have shown up in the quantity of dies released by automakers primarily.

WHILE malleable and steel castings production is high, gray iron operations are only moderately active but are creeping up slowly from the rate a month ago. Actually on light castings gray iron foundries are no more than holding their own. It is in heavy work, such as machine tool components, that best progress is now being made; and in this direction the outlook is the more encouraging for this fall.

Some foundries believe that the metal castings ceiling price regulation, CPR-60, which becomes effective Oct. 1, after postponement of a month, won't prove to be too complicated, as such regulations go. At least they think the regulation will be workable within the normal practice of the industry.

Cast scrap is in fair supply. Ferrous foundries in general would like to lay in more pig iron but say that under present operating conditions they are managing to make out reasonably well, particularly in view of the situation in cast scrap.

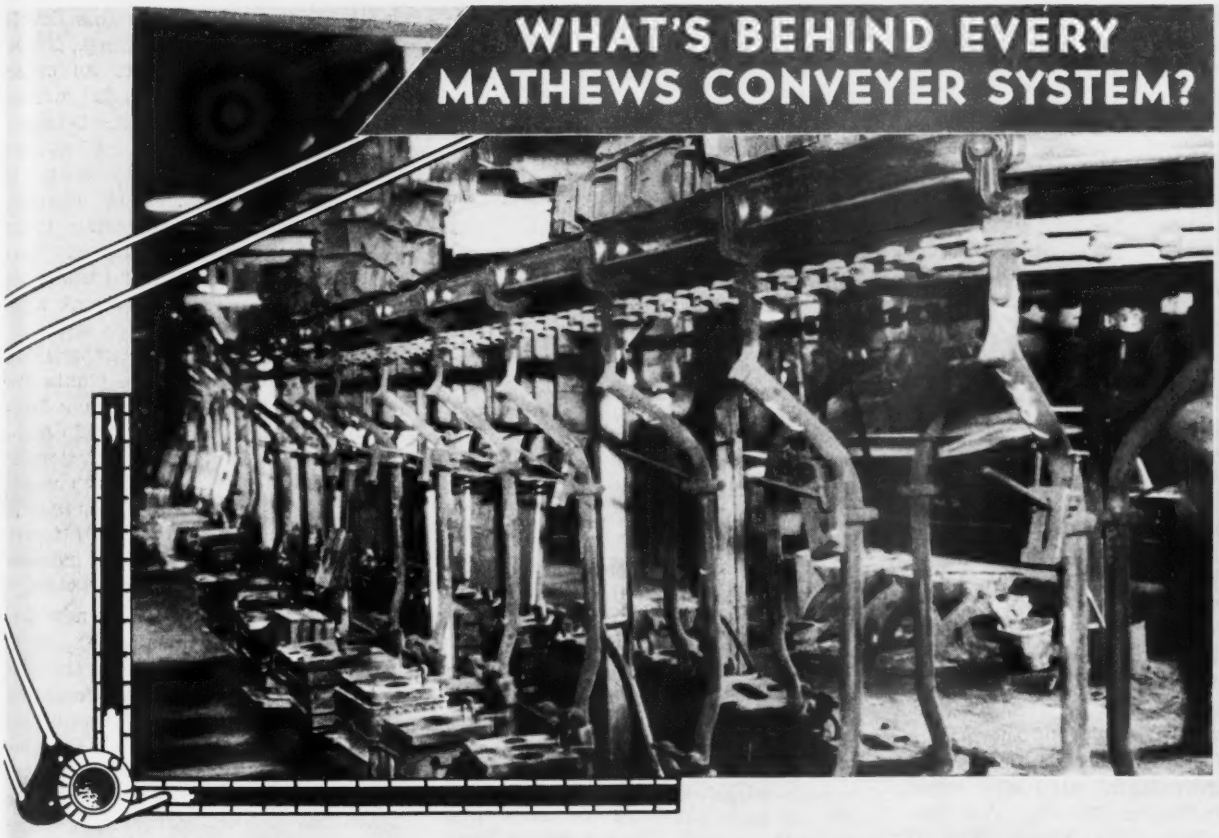
NATIONAL Malleable & Steel Castings Co. will construct a $750,000 physical testing laboratory for railway engineering development adjacent to its Cleveland Works. Among railroad equipment to be studied, tested and developed at the laboratory are rubber and friction-type draft gears for freight and passenger cars and motive power equipment, car couplers, freight car trucks, journal boxes and journal box lids, and similar devices for the mine and industrial fields.

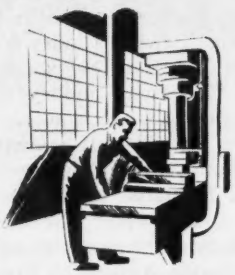
Testing equipment includes a 1-million pound static test machine, a 27,000-pound drop test machine, fatigue and angling machines, and other physical laboratory equipment. Two specially built railroad cars, containing electronic equipment and instruments for testing car attachments will be operated on test tracks inside and outside of the building. These test tracks are connected with outside railroad lines so that the cars can move over rail lines anywhere in the country in conducting tests under actual service conditions.

Plans also call for expanding new product development engineering into other lines such as automotive and truck equipment.

Reactivation of Diamond Magnesium Co.'s Painesville, O., plant will increase the area's supply of magnesium. Last December the General Services Administration asked the company to "demothball" the facilities and resume production. Magnesium metal now is being produced and the plant is expected to be in full

(*Continued on page* 178)





A skilled production force

● Mathews production people know how important it is to accurately interpret the plans of the engineering staff in fabricating conveyers and conveyer systems that operate efficiently and economically in the plants for which they were designed.

Years of experience are needed to acquire the mechanical skills that are necessary to build equipment that will take the punishment to which most conveyer systems are subjected, year after year, in actual performance.

A combination of balanced engineering, cooperative planning, skilled production and three well-equipped plants is a hard one to beat. That's why we can say . . . if it's Mathews equipment, it has to be right.

Need help with your materials handling? There are Mathews engineering offices or sales agencies in principal American and Canadian cities ready to serve you.

MEMBER FEMA

MATHEWS CONVEYERS

GENERAL OFFICES *Mathews Conveyer Company . . . . Ellwood City, Pennsylvania*
PACIFIC COAST DIVISION *Mathews Conveyer Company West Coast . . San Carlos, California*
CANADIAN DIVISION *Mathews Conveyer Company, Ltd. . . . . Port Hope, Ontario*

(*Continued from page* 176)
production by the end of the year. The plant originally was built by the government for $16 million and produced at an annual rate of 18,000 tons during World War II.

Washington

EXPERIENCED industry men have been appointed to the key posts in the newly organized Foundry Branch of NPA's Copper Division. Acting chief is Lt. Comdr. William A. Meissner Jr. Acting assistant chief is Julian A. Porter, on leave from his duties as president, Down River Casting Co., Rockwood, Mich.

Chief of the Conservation and Technical Section is Harold B. Gardner, previously metallurgist with the National Bureau of Standards and before that chemist for American Steel Foundries, Bethlehem Steel Co. and other concerns. Chief of the Allocation and Records Section is R. Barndell, a government man who served with the Copper Division, War Production Board, in World War II. Chief of the Program Section is D. Frank O'Connor, on leave as president, O'Connor's Foundry Inc., Hackettstown, N. J. Chief of the Facilities Section is Walter Clark, on leave as president, D. W. Clark & Co., Boston.

Commander Meissner is well known to the industry through having served as chief of the Foundry Branch, Copper Division, WPB, from February, 1942 through September, 1943, and through having served as officer-in-charge, Nonferrous Branch, Materials Division, Bureau of Ships, Navy Department, from September, 1943 through 1945. He left the Navy in 1945 to become assistant to president, and sales director, Silverstein & Pinsof Inc., Chicago, leaving that connection in 1947 to become Cleveland district sales manager for L. A. Cohn & Bro. Inc., Chicago. That connection was terminated at the end of 1950 when he was recalled by the Navy and again appointed officer-in-charge, Nonferrous Branch, Materials Division, Bureau of Ships. In his capacity as acting director, Foundry Branch, NPA's Copper Division, he is on loan from the Bureau of Ships.

Pittsburgh

OPEN-HEARTH expansion programs and increased demands put upon the machine tool builders have created an intense burden on local foundries. Coupled with materials shortages and manpower difficulties, the burden has resulted in order backlogs of six months to one year on many common standard foundry products. As evidence of this development Cooper-Bessemer Corp., Grove City, Pa., announced that its order backlog value increased $3 million since July 1 to $45 million. Demand picture at the captive Trafford Works of Westinghouse Electric Corp. is complicated by increased demand from company manufacturing units as well as jobbing customers. National Radiator Corp. and Pittsburgh Foundry & Machine Co. report similar increases.

Iron and steel scrap inventories at district foundries and steel plants are once again critically low after a late-summer "breathing period." No more is heard concerning consolidation of major melting grades of scrap under one price. Some demand increase is noted in pig iron as melters attempt to stretch scrap supplies by increasing iron ratios in melting practice.

Electro Metallurgical Co.'s new ferroalloy plant at Marietta, O., is in production. Plant represents the major share of a $135 million expansion and is largest of its type, employing about 2500 persons. J. C. Douglas is general superintendent. United States Steel Co.'s foundry at Edgar Thomson Works will undergo improvements in a modernization program rumored to be in the planning stage. Lewis Foundry & Machine Division of Blaw-Knox Co. has moved the Groveton foundry to the Pittsburgh Rolls section at 41st street. Only rolling mill machinery will be manufactured at Groveton. American Radiator & Standard Sanitary Corp. will enter the enameled steel sink field after converting the foundry at Preble Avenue to that production, according to Theodore E. Mueller, president. It is uncertain when the conversion will be completed.

SCRAP MOBILIZATION: Secretary of Commerce Charles Sawyer was principal speaker at the NPA Scrap Mobilization Day ceremonies in Cleveland, Sept. 8. Intended to emphasize the pressing need of foundries and steel mills for ferrous scrap, the affair was held in the scrap yard of A. Shaw Co. Inc. and marked the first operation of that company's new $250,000 scrap baling press. Other speakers, shown here left to right, included: Secretary of the Treasury John W. Snyder; Cleve H. Pomeroy, president, National Malleable & Steel Castings Co.; Sam H. Urdang, president, A. Shaw Co.; George A. Moore, NPA regional director, and Edward W. Greb, acting director Salvage Division, NPA, Washington

Chicago

ON March 30, the Slinger Foundry Co., a gray iron shop in Slinger, Wis., suffered a fire which destroyed its production facilities. Almost before the ruins were cold, M. O. Holtan, president, and William J. Holtan, vice president, called their 80 employees together and asked if they wanted to undertake the reconstruction themselves. The majority did. The company had a heavy backlog of casting orders and, by doing their own rebuilding, production could be restored quicker than by turning the job over to a contractor.

Plans were speedily drawn and the men went to work cleaning up and salvaging steel beams, masonry and equipment. The skills of welders, ma-

(*Continued on page* 180)

Completely New and Proven Operating Principle

Custom Built in any Length, Width or Depth

ADAMS ALUMINUM EASY-OFF FLASK

These advantages will cut your production costs!

RIGID CONSTRUCTION through proven corner design, permits reduced weight without the loss of maximum strength.

SOLID CORNERS are of the same design used on Adams Aluminum Slip Flasks. This interlocking tongue-and-groove construction is retained in perfect alignment with bolts secured through tapped end sections and locked with washers and nuts. Important! This construction has proved superior to other forms of corner design.

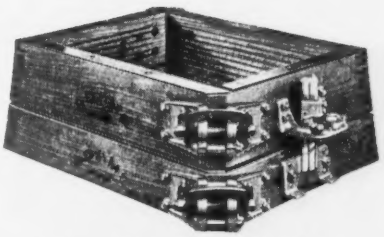
MALLEABLE TRIMMINGS are used on Adams Aluminum Easy-Off Flasks as on all other flasks we manufacture.

OPERATING MECHANISMS are identical with those used on the Adams Cherry Easy-Off Flask and incorporate the same simple adjustment and reversal of locking position.

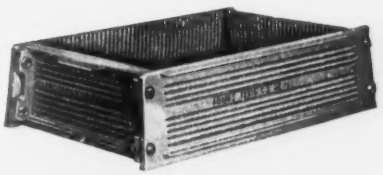
ADJUSTMENTS are made only when the mechanism is in locked position.

ALUMINUM PROTECTING STRIPS are standard equipment at top of cope and bottom of drag. Steel strips available upon request at no extra charge.

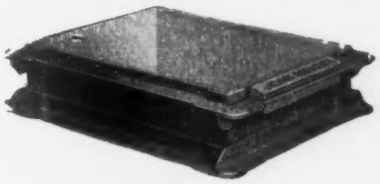
HANDLES AND TRUNNIONS are available when specified . . . at extra charge.



Adams Cherry Easy-Off Flask



Adams Jackets, Cast Iron or Aluminum



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Aluminum or Cast Iron Jackets—Steel Bands—Steel Upsets—Cherry or Aluminum Upsets

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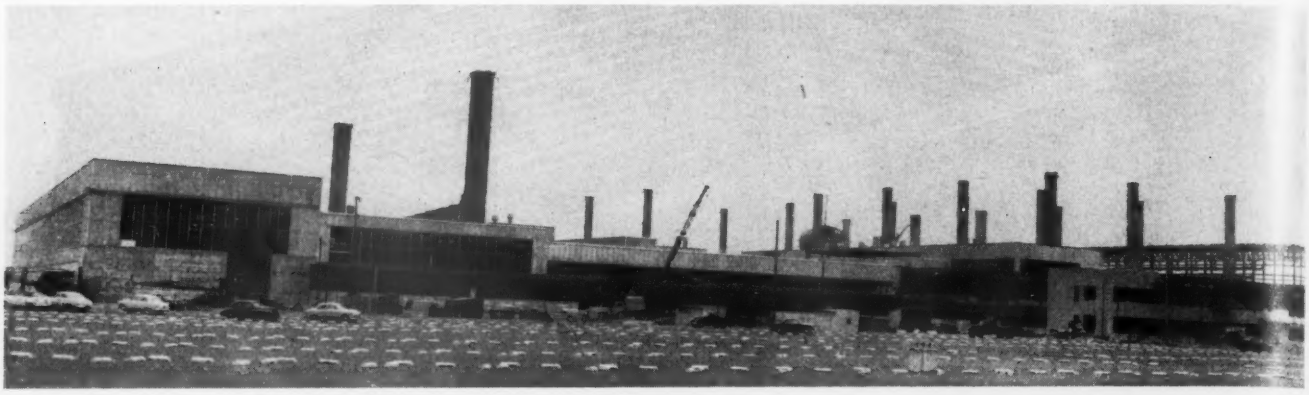
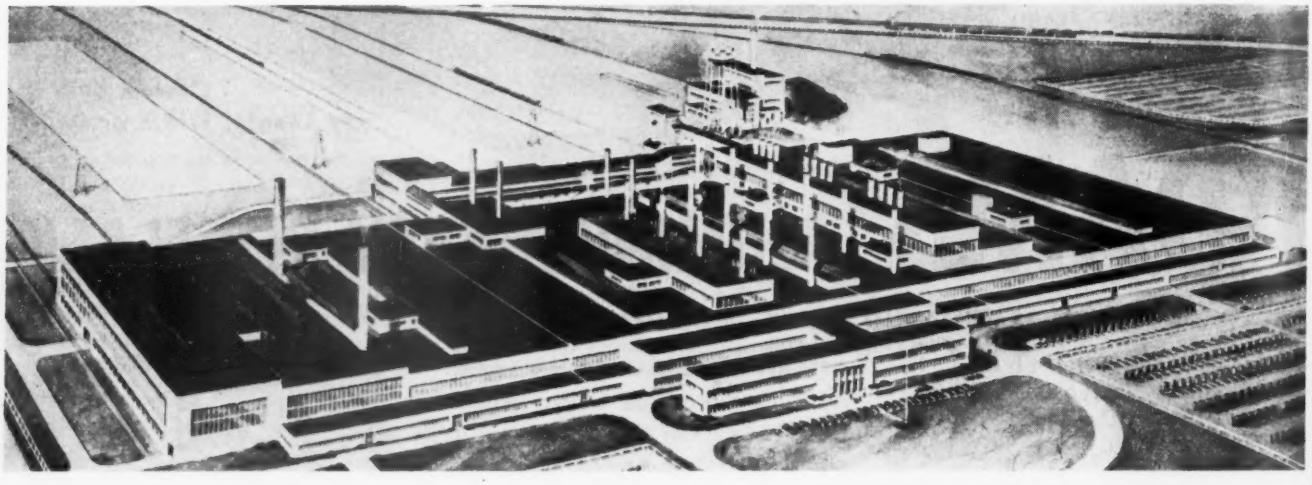
MOLDING MACHINES and FLASK EQUIPMENT

New Ford Foundry Expected in Production Early in 1952



WORK is progressing on the huge new Cleveland foundry of Ford Motor Co., but the plant is not expected to start pouring iron until early 1952. The view above shows the extent of construction about two months ago. Below is an architect's drawing of the complete foundry. Designed to make engine castings, the structure will have 1 million square feet of floor space. When in full operation the foundry will need 3500 employees.



(*Continued from page* 178)

sons, carpenters, and the like, developed among the workers. New molding machines, conveyors and sand handling facilities were installed. Exactly six weeks from the date of the fire, the first iron was poured. A few weeks later, full output was obtained. So quickly did the foundry get back into operation that virtually no business was lost. No men had been laid off, although a few had left for other jobs.

Rebuilding and re-equipping the foundry required numerous improvisations. One was the procedure for measuring water into the two sand mullers. Delivery on a water meter was too far extended to be considered. In place of a water meter a discarded but serviceable standard gasoline pump was installed. Only a new hose was needed. No motor was required to drive the pump because city water pressure does the chore. To provide a chuckle for a visitor, the pump shows water going to the mullers at a price of 20 cents per gallon. Among other improvising is use of wooden plows with rope and pulley controls for keeping molding machine sand hoppers supplied.

Since the foundry has resumed, the management has installed a sand laboratory and complete sand testing equipment. Incidentally, the shop uses 100 per cent synthetic sand.

For the foundrymen, there must be a moral to this story.

MOST district foundries are working a busy five-day week except pipe foundries, which are hard hit by the building slowdown and are cutting back operations. Some are pouring only 50 per cent of their usual tonnage.

Normally consuming as much as 1000 tons of scrap daily, the reduction of pipe foundry activity has eased the scrap supply problem for other district foundries. Some shops are now so well stocked with scrap they are turning down dealers' offers. This novel situation has given a weaker tone to the scrap market generally and prices are soft. Previously foundrymen had to scour Arizona and New Mexico to find scrap or they purchased remote scrap with high freight and hauling charges from dealers. Now foundrymen are able to more than satisfy their needs from dealers' local yards.

West coast foundries will soon benefit from 15,000 tons of scrap accumulated in Hawaii, following NPA appeal to government installations throughout the world to collect scrap. Also being prepared for shipment in Hawaii are 1500 tons of airplane alloy scrap and 1500 tons of bailing materials. Individual planters in the islands have collected 7500 tons of iron and steel scrap, NPA officials reported. Shipments of scrap to the mainland from Pacific islands, once fairly regular, are now rare occurrences.

Foundrymen also are not so gloomy over pig iron and coke supplies. Immediate prospects look good for ade-

(*Concluded on page* 182)

LOOK FOR QUALITY

in shot and grit that's *Metal Blast*

What is quality in shot and grit?

Quality means greater durability first. Quality also means using the best materials available to begin with. Quality also requires precise and accurate heat treating operations.

There is no second grade Metal Blast shot and grit. It's all first quality whether it's the finest hard shot and grit made, known as ANNEALSHOT, or the perfected malleable shot and grit, known as SUPER-ANNEALSHOT.

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GUARANTEE

If you don't agree that SUPER-ANNEALSHOT and GRIT are the best and most economical malleable abrasives you've ever used—return the unused quantity for refund—AT OUR EXPENSE.

ANNEALSHOT — **The finest *hard* shot and grit made, but sells at chilled shot prices.**

SUPER-ANNEALSHOT — **The perfect *malleable* shot and grit.**

(*Concluded from page* 180)

quate supplies of pig, they say, and rebuilding of its "A" blast furnace at Pueblo, Colo., at a cost of $1.5 million will enable Colorado Fuel & Iron Corp. to divert additional iron to foundries in 1952. Coke supplies have improved and foundrymen say there is more than enough to go around.

Officers of Southern California Chapter of the AFS for 1951-52 are: Henry W. Howell, Howell Foundry Co., president; Harold G. Pagenkopp, Angelus Pattern Works, vice president; Hubert Chappie, National Supply Co., secretary; Charles Gregg, Gregg Iron Foundry, treasurer.

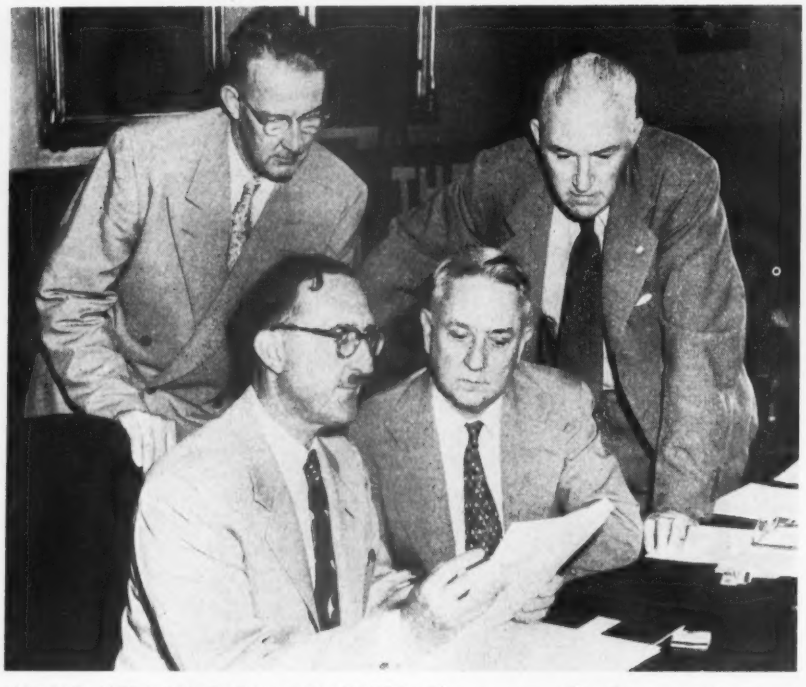
Philadelphia

AN UPTURN is reported in demand for gray iron castings, following a substantial let-down in business during the summer months. Present improvement is ascribed in part to the passing of the vacation season, a slightly better volume of defense requirements and a little more activity in civilian lines. However, there is still concern as to whether defense needs this fall will develop rapidly enough to take up the slack in civilian requirements.

Operations at steel and malleable foundries have been well sustained throughout the summer, with demand still strong. Both groups appear to have backlogs extending 16 weeks or beyond. The steel foundries have heavy orders on hand from builders of large trucks and from manufacturers of electrical equipment and materials handling machinery. Railroad buying is not as pressing as several weeks ago but is still good. Malleable shops are likewise in receipt of substantial orders from consumers in these lines, plus an active business in pipe fittings.

Business in nonferrous castings appears to be only moderately active, certainly not as brisk as it was in the first several months of this year. While these foundries operate almost entirely on rated work in order to get their raw materials—copper and aluminum in particular—they, along with other casting plants, have very little in the way of direct defense work.

Ferrous foundries report cast scrap as being adequate, and some say that they are finding pig iron in a little better supply. However, the latter continues scarce from an overall standpoint. Little foreign iron is being purchased because of the premiums asked and the uncertainty as to deliveries. Labor is a little tighter even in the unskilled classifications.



WORLD METALLURGICAL CONGRESS: These men will take an active part in the first World Metallurgical Congress to be held in Detroit, Oct. 14-19, simultaneously with the 33d National Metal Congress and Exposition. Shown here at a recent meeting of trustees and officers of the American Society for Metals, sponsors of the international meeting, are, seated: Walter E. Jominy, ASM president and Chrysler Corp. chief metal consultant; Dr. James T. MacKenzie, American Cast Iron Pipe Co., Birmingham; (standing) Thomas G. Digges, National Bureau of Standards, Washington, and Ralph L. Wilson, Timken Steel & Tube Co., Canton, O.

Gray Iron Founders To Meet in Chicago

Gray Iron Founders' Society will hold its 23rd annual meeting at the Edgewater Beach Hotel, Chicago, Oct. 25-26. Program of the two-day conference will feature discussion of problems relative to military casting requirements and government regulations affecting material controls and casting prices.

Society President E. L. Roth, president, Motor Castings Co., Milwaukee, will preside at the meeting, which will open at 9:30 a.m. Oct. 25. In addition to reports of officers and committee, and consideration of topics relating to defense activities, a panel discussion on quality control is scheduled.

Details of the tentative program follow:

Thursday, Oct. 25

8:30 a.m. Registration

9:30 a.m. Business session:
Remarks of the president—E. L. Roth, Motor Castings Co., Milwaukee.
Report of the treasurer—H. J. Trenkamp, Ohio Foundry Co., Cleveland.
Report of the executive vice president—D. H. Workman
Report of technical director—C. O. Burgess
Reports of committee chairmen
Report by the President, FEF—John M. Price, Ferro Machine & Foundry Co., Cleveland.
Report on National Castings Council—E. L. Roth
Report on Gray Iron Advisory Committee to OPS—C. R. Culling, Carondelet Foundry Co., St. Louis.
Report on Gray Iron Advisory Committee to NPA—Walter Seelbach, Superior Foundry Inc., Cleveland, O.

12:30 p.m. Industry Luncheon

2:30 p.m. Business Session:
Panel Discussion on Quality Control. Subject: "The Installation and Practical Value of a Foundry Quality Control Program in Large and Small Foundries."
Speakers and panel members: H. W. Stuart, U. S. Pipe & Foundry Co., Burlington, N. J.; Max Kuniansky, Lynchburg Foundry Co., Lynchburg, Va.; E. L. Fay, Deere & Company, Moline, Ill.; Dr. A. E. Schuh, U. S. Pipe & Foundry Co., Burlington, N. J.

4:15 p.m. GIFS Committee Meetings

6:30 p.m. Industry banquet

Friday, Oct. 26

9 a.m. Registration

9:30 a.m. Business sessions:
Subject: "Profit Sharing Plans." Speaker: George C. Nixon, Pension & Profit Sharing Planners, LaCrosse, Wis.
Defense Production Panel. Subjects: Military Castings Requirements and Material Controls. Panel members: Maj. Gen. F. H. Griswold, USAF, Military Director for Requirements, and chairman, Foundry Industry Advisory Committees to the Munitions Board, Washington; A. J. McDonald, chief, Castings Section, Iron and Steel Division, NPA, Washington.

12:45 p.m. Industry luncheon
Speaker: Rear Admiral Ellis M. Zacharias. Subject: "Today's World — Tomorrow's Peace"

3 p.m. Special Price Control Clinic:
Subject: CPR-60—Castings Price Regulation. Discussion Leaders: Representatives of the Office of Price Stabilization and members of the Gray Iron Advisory Committee to OPS.

. . . dozens of man-hours— by a few minutes of Radiography

THERE's a lot of skilled machinist time invested between a cast bronze blank and a finished precision gear. And it's time all lost when you wait until the cutting tool exposes a gas hole or other irregularity in the casting causing rejection.

Nowadays that time can be saved—saved by first proving the casting sound—by Radiography. Foundries that do this can be certain that only high-quality castings are released. And this is the basis for an enviable reputation. What's more, radiography often suggests changes in casting methods which increase the yield in production runs.

Get in touch with an x-ray dealer. Ask him to give you more details on how Radiography can better your foundry operations and increase production. Send for a free copy of "Radiography as a Foundry Tool."

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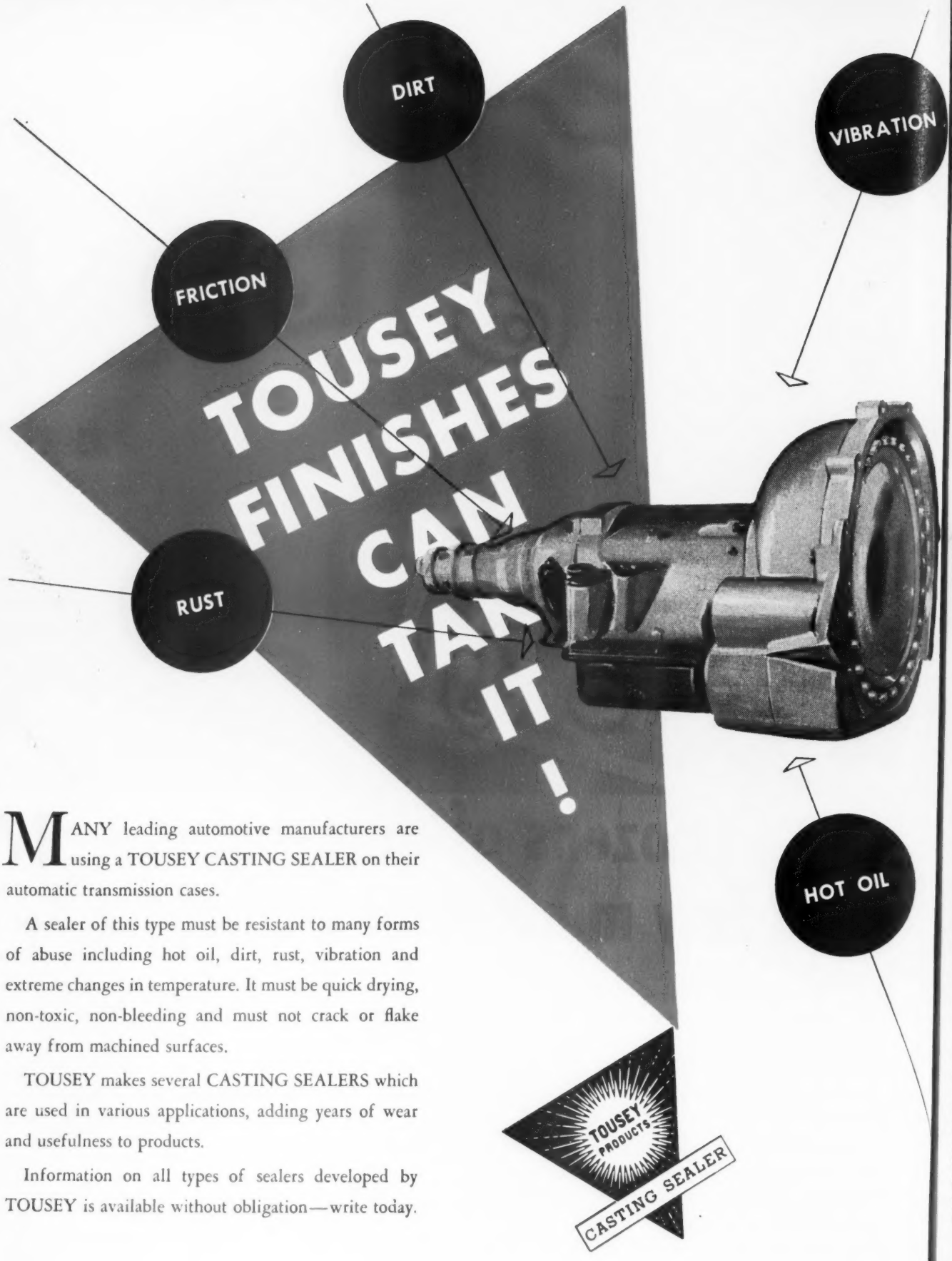

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TOUSEY makes several CASTING SEALERS which are used in various applications, adding years of wear and usefulness to products.

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New England Conference To Be Held Oct. 19-20

Eleventh New England Regional Foundry Conference will be held Oct. 19-20 at Massachusetts Institute of Technology, Cambridge, Mass. As in recent years, the meeting is sponsored by the New England Foundrymen's Association in co-operation with MIT and various other foundry and technical societies.

Eight technical discussions are scheduled for the two-day program, which opens at 10 a.m. Friday. The subjects include: "Practical Aspects of Nodular Iron," by Thomas E. Eagan, Cooper-Bessemer Corp., Grove City, Pa.; "Basic Lining," by Clyde Armstrong, Warren Pipe Co. of Massachusetts; "Things We Do Not Know About the Nonferrous Foundry Industry," by William B. George, R. Lavin & Sons Inc., Chicago; "Gates and Risers," by Pat Dwyer, FOUNDRY, Cleveland; "Cupola Practice with Materials Available Today," by Warren V. Baker Jr., Draper Corp., Hopedale, Mass.; "Foundry Sand," by Henry C. Stenberg, Draper Corp., and Howard F. Nye, Crompton & Knowles Loom Works; "Variables in the Coreroom—Then and Now," by L. P. Robinson, Archer-Daniels-Midland Co., Cleveland, and "Welding, Joining and Cutting of Gray Iron."

Northwest Foundrymen Plan Conference

Northwest Regional Foundry Conference, sponsored by the Washington, British Columbia, Oregon and Oregon State College Student Chapters of the American Foundrymen's Society, will be held Oct. 5-6, in Vancouver, B. C., Canada. Chairman of the conference will be W. M. Armstrong, associate professor, Department of Mining and Metallurgy, University of British Columbia, who is chairman of the British Columbia Chapter.

Speakers will include I. R. Wagner, vice president, William W. Maloney, secretary, and A. M. Ondreyco, a director, of the national AFS organization, as well as Saul F. Gertsman, Dominion Department of Technical Survey, Norman Terry, president, Canadian Cost Accountants Association, and Lawrence Pridmore, vice president, International Molding Machine Co., La Grange Park, Ill.

Book Review

Die Casting, by H. H. Doehler, cloth, 502 pages, 6 x 9 in., published by McGraw-Hill Book Co., New York. Price $8.

A thorough coverage of the possibilities of die casting as a fabricating technique, this book reflects the combined knowledge and experience of Doehler-Jarvis Corp., New York, producer and finisher of die castings. It discusses the production, engineering, design and materials of die casting, and points out probable future trends and developments.

Production data are given on hydrauliscope analysis on injection processes, automatic ladling, die selection and die manufacturing. Common practices for machining and hobbing dies, methods of metallurgical control of die steels, and the heat treatment of dies are discussed.

PURDUE FOUNDRY CONFERENCE

To Stress Modern Control

WITH the theme "Better Castings from Modern Controls," the annual Metals Casting Conference to be held at Purdue University, West Lafayette, Ind., Nov. 1-2, will cover subjects relating to quality control, inspection, cupola operation, core making and personnel training.

The conference is being sponsored by the university in co-operation with the Central Indiana and Michiana chapters of the American Foundrymen's Society. Robert Spurgin III, Swayne, Robinson & Co., Richmond, Ind., is conference chairman, and L. D. Reiff, Superior Steel & Malleable Castings Co., Benton Harbor, Mich., is program chairman.

In conjunction with the conference an open house will be held at Purdue's newly modernized foundry.

Details of the conference program follow:

Thursday, Nov. 1

9 a.m.—Registration.

10 a.m.—Welcome from the university by Dean A. A. Potter: "University's Interest in Industry."
Response from I. R. Wagner, vice president of AFS: "Industry's Interest in Education."

10:45 a.m.—Co-chairmen—H. A. Bolz, head, Dept. of General Engineering, Purdue University and V. S. Spears, American Wheelabrator & Equipment Corp.
"The Evaluation and Training of Personnel for Industry," Ernest H. Reed, International Harvester Co., Chicago.

1:30 p.m. — Chairman — Dr. R. M. Whaley, Dept. of Physics, Purdue.
"Looking Inside Castings with Atomic Energy," John C. Pennock, Tracerlab Inc., Boston. Demonstration of radiography with cobalt "60."

3 p.m.—Chairman—W. G. Ferrell, Auto Specialties Co., St. Joseph, Mich.
"The Practical Side of Nondestructive Testing with Corrective Measures," Royal G. Tobey, Eastman Kodak Co., X-ray Division. Exhibits showing examples of testing and correcting.

6:30 p.m. — Banquet — Toastmaster — Stanley Krzeszewski, American Wheelabrator & Equipment Corp.
"How Confused Can We Get?" Ed. McFaul, world traveler and speaker, Northwestern University.

Friday, Nov. 2

10 a.m.—Co-chairmen—Carl Schopp, Robert Spurgin III, Swayne, Robinson & Co.
Movie—"The A.D.M. of Cores." Discussion by W. B. Bishop, Foundry Products Div., Archer-Daniels-Midland Co., Cleveland.

11 a.m.—Co-chairman—E. G. Richardson, Delco-Remy, Anderson, Ind., Dr. G. M. Enos, Purdue University.
"Sources of Trouble in Cupola Operation," Walter Jaeschke, Whiting Corp.

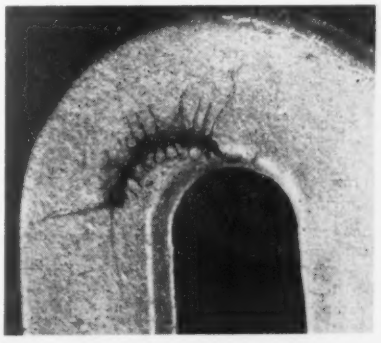
1:30 p.m.—Co-chairmen—Dr. I. W. Burr, Purdue University, C. E. Westin, Superior Steel & Malleable Castings Co., Benton Harbor, Michigan.
"Practical Quality Control," R. W. Gardner, supervisor of quality control and inspection, Dearborn Iron Foundry of Ford Motor Co.

2:30 p.m.—Co-chairmen—James Barrett, S. F. Swain, Golden Foundry Co., Columbus, Ind.
Movie—"Mechanization in Molding," Harold Weimer, Beardsley & Piper Division, Pettibone Mulliken Corp.

3:30 p.m.—Summary of conference by Paul Harlan, Electric Steel Castings Co., Indianapolis.

Mythical Casting Worm Is Caught in the Act

TALES of the iron worm being resposible for porosity in castings have been heard for years in foundry circles. The truth of these stories is doubted by most "in-the-know" foundrymen, although some laymen have been convinced of the worms' existence. To convince unbelievers, however, R. W. Miller, 23 Humboldt St., Freiberg, Saxony, Germany, has furnished the accompanying photograph showing a worm caught in the act of performing his dirty work in a casting. This variety of worm, however, prefers light metal to iron. Of course, as Mr. Miller points out, the millipede might have crept into the mold while it stood empty during the night and was trapped against the mold wall when the molten metal was poured the following morning. At any rate, the contours of the burned body were found on the casting when it was shaken out.



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Osborn's Advanced Engineering starts in your foundry when factory trained field engineers survey your moulding problem with your superintendent. Complete operational data is then sent to Osborn's staff of engineers at the factory.

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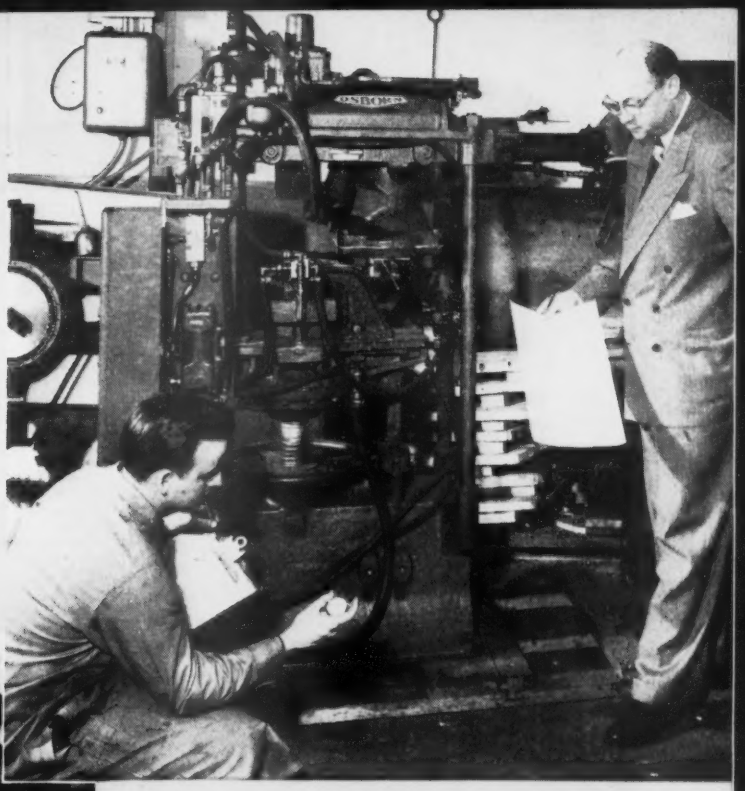

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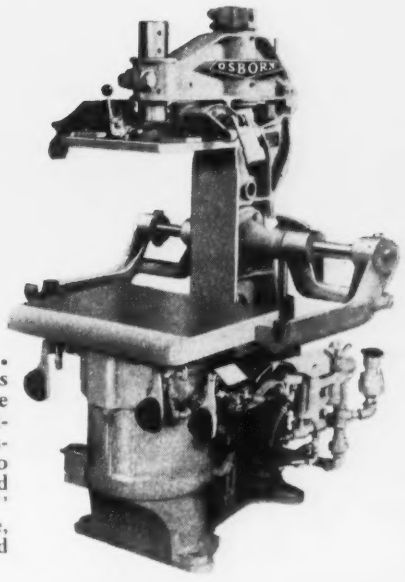

Osborn "ROTA-LIFT"... performs 5 major operations in making moulds from large metal plate patterns. By rolling over, drawing and closing the mould, in addition to conventional jolting and squeezing, "ROTA-LIFT" cuts operator fatigue, increasing your mould production.

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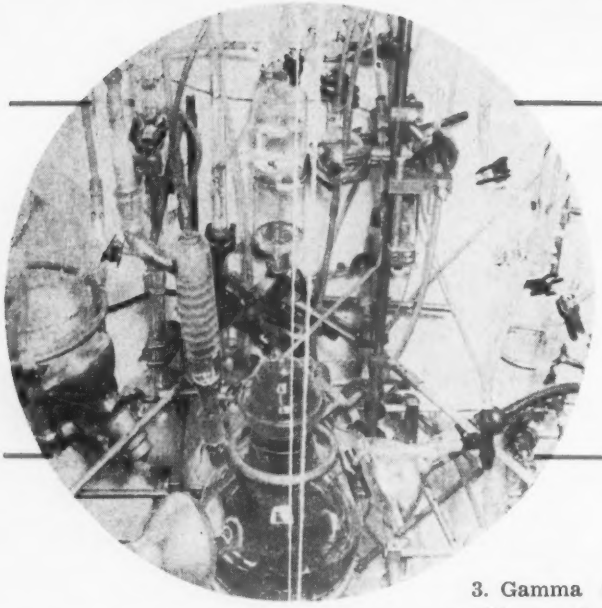
MOULDING MACHINES

CORE BLOWING MACHINES

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA



ATOMIC BY-PRODUCTS

. . . for the Foundry

By THOMAS A. DICKINSON

FROM the foundryman's point of view, by-products of America's atomic energy project are of fundamental and practical value at this writing because:

a. They can be used in the development of new casting alloys.

b. They can be used to prepare and to maintain the quality of existent alloys for casting purposes with unprecedented efficiency.

c. They will facilitate the cleaning and inspection of castings.

d. They should lead to the development of new and useful cast-alloy products.

Most of the subject by-products can now be described as "radioisotopes"—materials such as iron, calcium, carbon, sulphur, phosphorus, cobalt, silver, nickel, tungsten, copper, and zinc whose atoms have been ruptured by the same type of nuclear bombardment that is used in converting uranium into A-bomb explosives.

Such radioisotopes resemble A-bomb components to the extent that they are chemically unstable; but, where radioactive uranium and plutonium tend to institute explosive "chain reactions," the radioisotopes merely disintegrate—breaking down into nuclear particles or radiations, which can be generally classified as follows:

1. Alpha rays — comprising fairly large particles of positive electricity. These particles have relatively little ability to penetrate solid substances, but are highly destructive in certain circumstances.

2. Beta rays—comprising moderately large particles of negative electricity. These particles have some ability to penetrate solids, but are not as destructive as alpha rays in most circumstances.

3. Gamma rays--comprising both positive and negative particles of electricity. These particles are fairly small, capable of penetrating numerous substances, and include (among other things) the radiations known as x-rays.

4. Neutron rays—comprising electrically-neutral particles. These particles are very small, may move with the speed of light, and can penetrate virtually any substance.

Because their radiations are due to nuclear disintegration, radioisotopes eventually lose their ability to produce energy. However, their output can be controlled much the same as the strength of a permanent magnet is preserved with a "keeper" for many practical applications.

Concentrated radioisotopes radiations can be dangerous if used without certain precautions; yet, in many circumstances, the equipment required for the safe handling of radioisotopes is not nearly so elaborate or expensive as the furnaces and accessories required to utilize the radiations from an ordinary fire.

For example, where it is necessary to ascertain the extent of impurities in steel, a dilute radioisotope such as "radio-sulphur" can be used to permeate a non-radioactive component of the same type in molten steel so that the existence of the latter component can be measured with an instrument such as the Geiger counter (before casting) or with photographic films or plates (after casting). Dilute radioisotopes are substances whose radioactivity has been diminished by age or by dispersion in non-radioactive materials, and their radiations may be so mild and harmless that they can safely be consumed by a sick man for medical purposes.

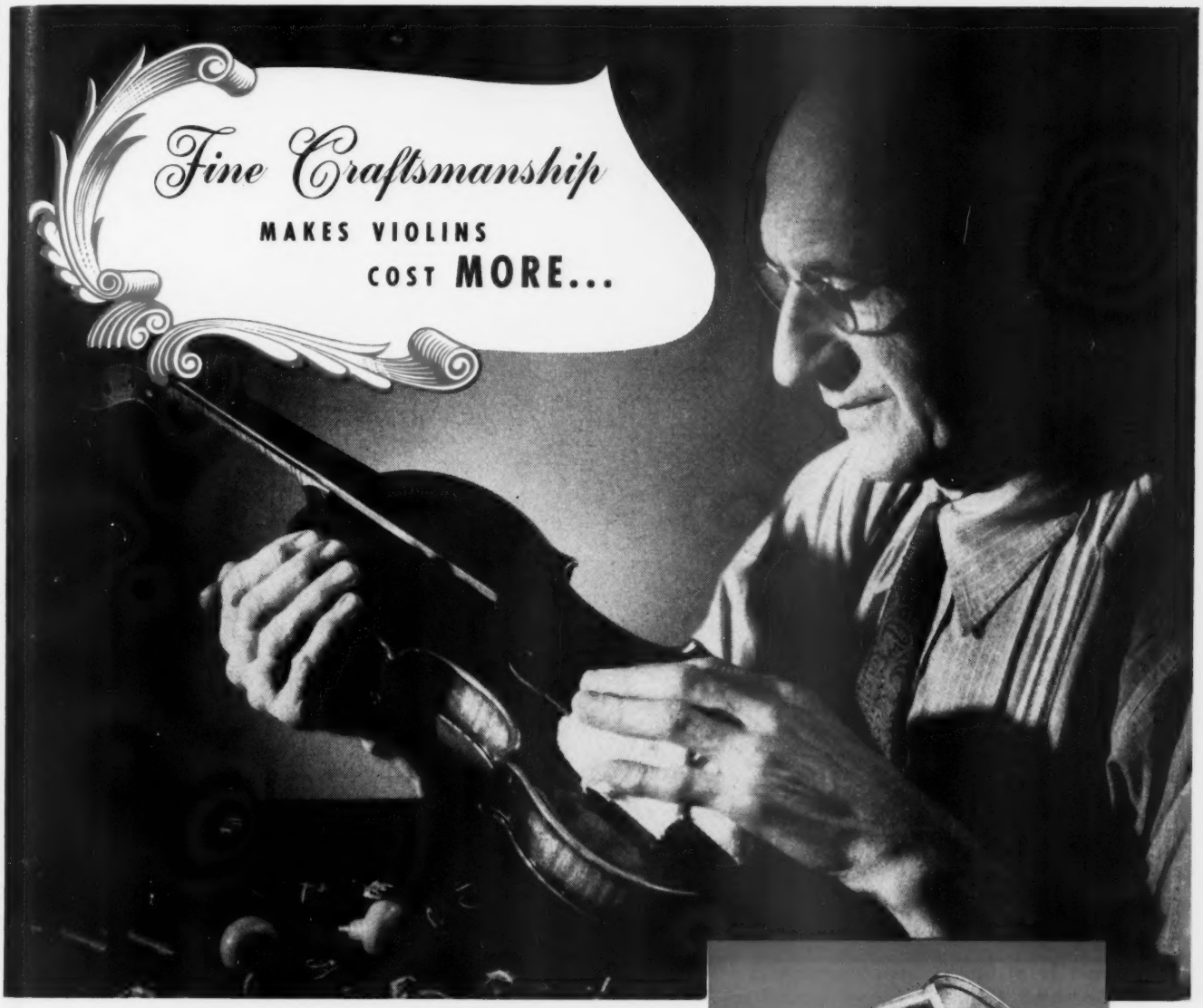
Less than an ounce of a dilute radioisotope can be used as a "tracer" in several tons of steel; and, in addition to facilitating the measurement of impurities in alloys of all types, these tracers are now being used by metallurgists to develop better metallic materials—for instance, by making it possible to ascertain the dispersion of different elements in accordance with the physical properties of cast alloys.

Major industrial users of radioisotopic tracers for the development of new alloys now include Dow Chemical Co.—where radiocarbon is being employed to determine the effects of carbon compounds in altering the grain size of magnesium alloys—and General Electric Co. — whose engineers are reportedly using "radiometals" in the development of new

(*Continued on page* 191)

Typical Radioisotopes

Chemical Element	Atom No.	Isotopic Mass No.	Radiation Type
Antimony	51	122	Beta, Gamma
Carbon	6	14	Beta
Cobalt	27	60	Beta, Gamma
Chromium	24	51	Electron, Gamma
Copper	29	64	Beta, Electron, Gamma
Gold	79	198	Beta, Gamma
Iron	26	55	Electron, Gamma
Molybdenum	42	99	Beta, Gamma
Nickel	28	59	Gamma
Selenium	34	75	Electron, Gamma
Polonium	84	210	Alpha, Gamma
Tungsten	74	185	Beta
Zinc	30	65	Beta, Electron, Gamma



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The skilled hands, the infinite patience and the justifiable pride in a job well done are ingredients necessary to the production of a fine and costly violin. And . . . it's pretty much the same in our production of fine pattern equipment *with one important exception.* Yes, the kind of craftsmanship we're talking about, still exists here at Buffalo Pattern and has for over half a century. The pride, the patience and the precision, of minds, hands and tools are all here. Now, as in the past, they are busy producing top-notch pattern equipment for particular people everywhere.

WHAT'S THE EXCEPTION we spoke about above? Well it's just this: You may travel a little farther, you may pay a few dollars more for a Buffalo Pattern, but it *actually costs you less* in the long run. This kind of fine craftsmanship produces equipment that cuts your scrap ratio to the minimum. Always remember: "When it comes to buying patterns, you pay for them in dollars or you pay for them in scrap."

This quality magnesium casting for an aircraft engine was molded from a precision Buffalo Pattern. It's a large casting (Approx. 42" in diameter and 24" high) of developed contours and the problem of retaining very thin metal walls was really tough. Well, we did it, and the minimum of scrap on this one will pay for the equipment many times over.

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(*Continued from page* 188)

heat-resistant steels for gas turbine engines.

A variation of the tracer technique has been developed by researchers at Stevens Institute of Technology, Hoboken, N. J., to permit the study of self-diffusion in stressed metals. This involves the use of radiozinc and radiocopper, and has been officially described as follows:

"Single crystals of metal are electroplated with the radioisotopes and placed under stress in a furnace at temperatures approaching the metals' melting point. When the radioactive coating has had sufficient time to diffuse into the crystal, the specimen is removed and sectioned. The activity of each section is then measured to obtain the amount of diffused material at various distances from the original plated surface; and, from this, the diffusion coefficient and the activation constant may be ascertained."

Similarly, radiotin and radiothallium are being used at California Institute of Technology to study the color of inorganic compounds and the relation of color to the exchange reactions between different oxidation states of an element in solution. Data thus obtained are showing for the first time how electrons can be transferred from one molecule to another in the presence or absence of light; and, since electron transfer is important in numerous chemical reactions as well as in the design of electrical conductors, this should eliminate the need for many costly experiments in the development of future industrial products.

For the production control of the microstructures of steel alloys, Westinghouse Electric Corp. has successfully used radiocarbon materials. Complete details regarding the Westinghouse techniques are not yet known; but company officials have stated that one process consists of introducing a radiocarbon tracer into iron via a charcoal mixture for pack carburizing purposes.

In addition to applications as tracers for production purposes, radioisotopes have made it possible to design and use a number of unusual production-control instruments. For instance, in a gage developed by Goodyear Tire & Rubber Co., dimensional variations amounting to as little as one micron have been constantly and accurately detected in thin sheet or foil-type production materials (without mechanical contact) by means of a gage which has been officially described as follows:

"The material passes through a slot in the gage. Below this slot, there is a small quantity of the radioisotope. Above the slot, there is an ionization chamber in which a minute electrical current is produced by rays from the radioisotope. The latter current is amplified by subminiature vacuum tubes to the point where it is sufficiently large to operate an ordinary electric meter, which is calibrated to designate dimensions in terms of the strength of the radiations given off in each particular circumstance."

Operation of the latter instrument is described here because it indicates a principle which is adaptable in many ways to the inspection of castings. For example, at Industrial Radiography Laboratory, Beaumont, Tex., radiocobalt has been similarly used as a high energy gamma - ray source for radiography—making it possible to expose photosensitive materials for the inspection of steel castings whose thicknesses (up to 15 in.) could not be penetrated by the output of a million-volt x-ray machine.

Applications of the latter type, of course, require the use of extremely intense radioisotopic radiations. However, the necessary concentrations of radioisotopes can be purchased inexpensively and housed in lead or equivalent retainers without endangering the personnel who must handle or use the radioisotopes in their investigations.

J. C. Harris and R. E. Kamp of Monsanto Chemical Co., have extensively investigated actual and potential uses for radioisotopes in connection with cleaning or degreasing metal products; and they apparently feel that a reversal of the aforementioned

PUMP BASE: Approximately 28,000 lb of Navy M leaded tin bronze were poured at Baldwin-Lima-Hamilton Corp., Eddyston, Pa., to produce this base of a centrifugal pump casing for oil refinery service. It is 9 ft, 9in. long from its 36 in. ID inlet to 30 in. ID outlet and weighed approximately 20,000 lb after removal of gates and risers. Metal was poured at 2160°F into the cement bonded mold

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Molders find this gun very useful for spraying molds and cores with any liquid. It can be used for cleaning electric motors, gasoline motors and machinery. Also for laying dust. It has a Neoprene disc valve, a trigger control, and is made of good brass. Length overall 6½". Weight without suction hose and sinker 18 oz. Two nozzles, ⅛" and ¼".

$10.00

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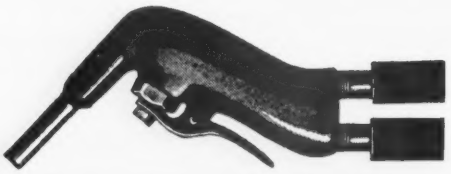

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PRICES COMPLETE WITH SUCTION HOSE AND SINKER

PIPE SIZE	1/16"	1/8"	1/4"	3/8"	1/2"
PRICE F. O. B. HAMILTON, O.	$12.00	$12.00	$12.00	$14.50	$18.00

This tool eliminates swabs, brushes and spray cans. With it a man can blacken molds faster and more efficiently. The MURPHY PISTOL SPRAYER shoots the blackening into hidden pockets, beyond swab reach. Jobs are finished faster, the resulting castings peel better and the work comes cleaner. Used for silica wash, oil, water or any liquid material.

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tracer technique can now be regarded as practical in many circumstances where an extreme lack of surface contaminants is mandatory.

The latter "reverse technique" consists of permeating the grease or dirt on a product with a dilute radioisotope prior to cleaning operations, so that invisible remnants of dirt or grease can be detected as minute radiations after the product is processed with a cleaning solution or solvent by means of an instrument such as the Geiger counter.

At Massachusetts Institute of Technology, radioisotopes of iron and chromium have been used to provide bearing surfaces for castings so that the effects of friction could be studied in accordance with the quantities of materials transferred by friction from radioactive to non-radioactive surfaces. Resultant measurements have indicated material transfers amounting to as little as 5 micrograms of metal, and are responsible for the current theory that material transfers are an inherent concomitant of friction.

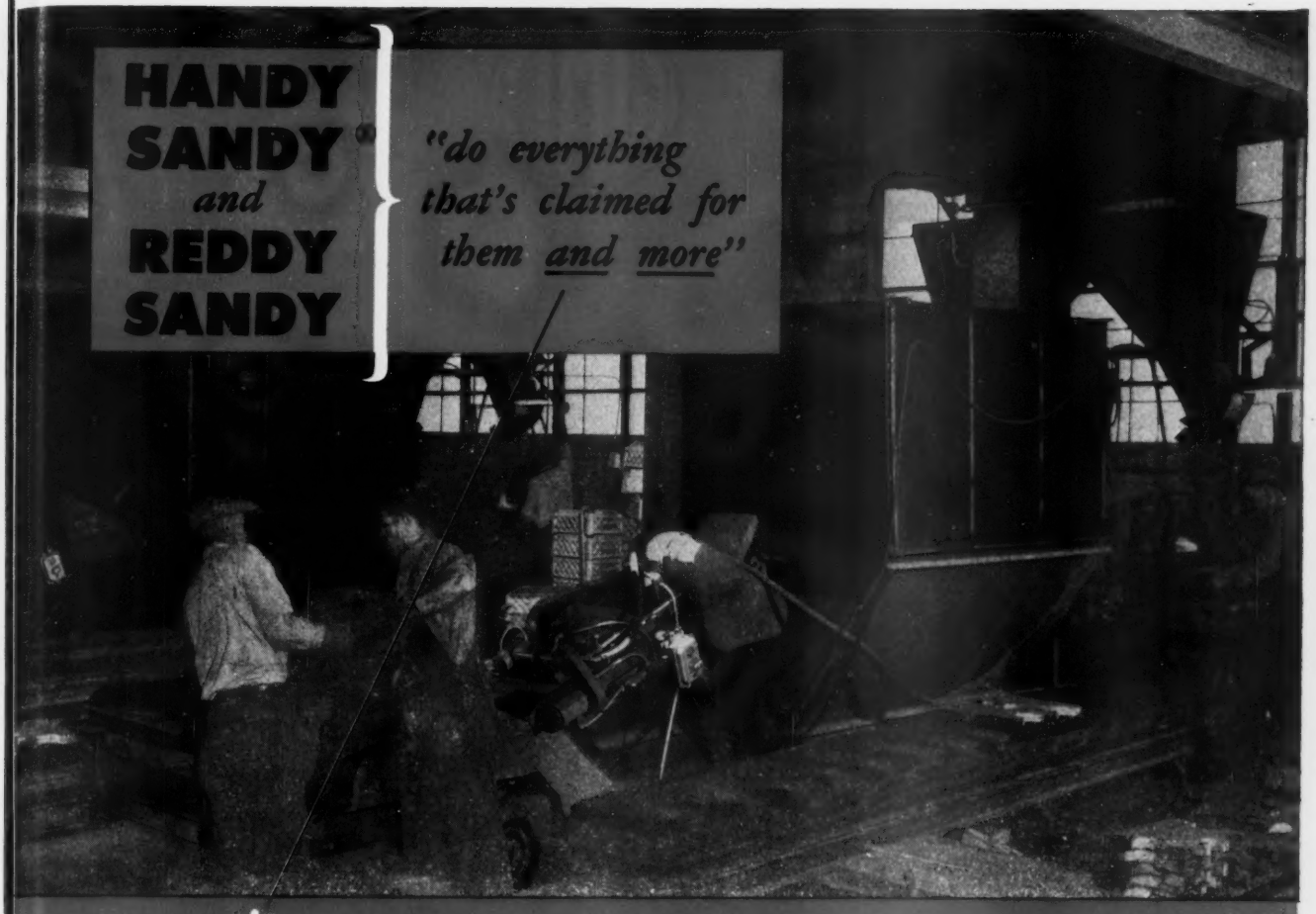
Merit Foundrymen's Attention

Isotopic particles in certain metallic and nonmetallic elements are classified as "stable" because they are not affected by the nuclear bombardments which cause other isotopes to become radioactive. The stable isotopes are now being electromagnetically segregated from radioisotopes by Carbide & Carbon Chemicals Corp. (Y-12 Plant, Oak Ridge, Tenn.), and should merit considerable attention on the part of foundrymen whose work may necessitate the production of castings which are resistant to the "contaminating" effects of radioactive particles.

A good example of the atomic "by-product" which is not based on the production or use of radioisotopes is the Statitron recently developed by North American Aviation Inc., Los Angeles. The Statitron is a midget version of the electrostatic generators which have heretofore been used in the production of atomic bombs, and its purpose is to convert ordinary electrical current into a high-voltage electron beam which is similar to the output of an x-ray machine (that is, aside from the fact that such output may have the intensity required to alter the physical properties of metallic materials).

Operation of the Statitron involves the conversion of alternating current into static electrical charges by means of a high-voltage transformer and rectifier. These charges are applied to an endless friction belt, which is vertically mounted on two rollers, so that they can literally be

(*Concluded on page* 194)



{signed} Walter A. Backus, President

UNITED STATES FOUNDRY CORPORATION, Milwaukee, Wisconsin

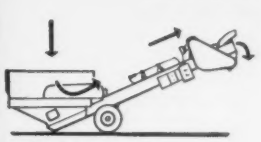
INCREASED MOLD PRODUCTION 35%

Sometimes in the enthusiasm of making a sale, advantages will be claimed for equipment that are never justified. However, the many claims that we've made for the Handy Sandy and the Reddy Sandy have been proven many times over . . . all over the country. At United States Foundry, they tell us that "Installation of these machines has made a vast improvement in working conditions and has increased over-all production thirty-five per cent. They are doing everything that was claimed for them *and more.*"

Yes, the Handy Sandy and Reddy Sandy give even better performance than promised. They provide an individual-floor sand handling system that makes it possible to produce more molds at a lower cost per mold. They perform the complete shakeout and sand conditioning cycle using less manpower and deliver the sand into an overhead storage hopper where it is convenient to the molder, thus giving him more molding time. The result is obvious. Manpower is conserved. Time and space are saved. Costs are reduced.

Get the facts today. Write for your copy of the new catalog just released: "Planned Mechanization for Foundries."

FROM SHAKEOUT TO FLASK WITHOUT SHOVELING



Reddy Sandy performs the complete shakeout and sand conditioning cycle at one time . . . without shoveling.

Handy Sandy puts the sand pile overhead to eliminate waste motions for the molder.

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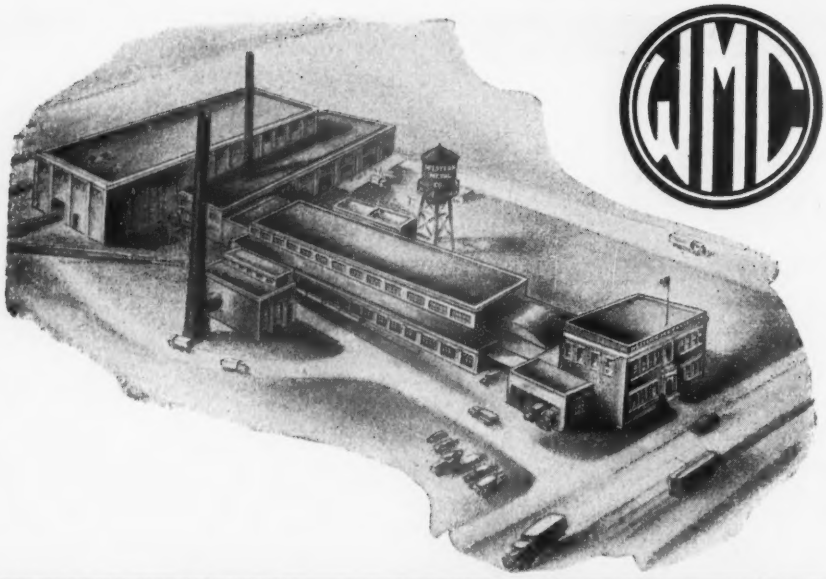

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(*Concluded from page* 192)

conveyed to the top of a steel-ring tower with the power of an ordinary electric motor. Static charges are concentrated at the top of the tower by means of a collector dome. Then (by means of a generator, transformer, and filament in the dome) the electronic particles comprising the charges are figuratively "shot downhill" through an x-ray tube—capacity of which makes it possible to bombard a metallic "target" with as many as 60 thousand billion electrons per second.

The Statitron's bombardment of a target does not actually split atoms, like the bombardment of a cyclotron, but it does displace certain atomic particles—much the same as particles are displaced when a metal is work hardened. Therefore, since the energy output of the Statitron can be controlled with optimum precision, it is now possible to:

1. Determine exactly what causes different materials or parts to fail in service.

2. Harden or temper metallic materials without heat-treatments.

3. Generate "super X-rays" which can penetrate more than 2 feet of solid steel for radiographic inspection purposes.

Another new product, whose design is based on knowledge of atomic-energy phenomena, is a cast-alloy "blow gun" recently developed by Canadian Radium & Uranium Corp. This gun has a radioactive-foil liner or filter, and its purpose is to ionize a jet of air flowing through the gun so that the air can be used to dissipate electrostatic charges—which have heretofore been regarded as unavoidable sources of machine failures, fires, explosions, and personnel accidents in industries of all types.

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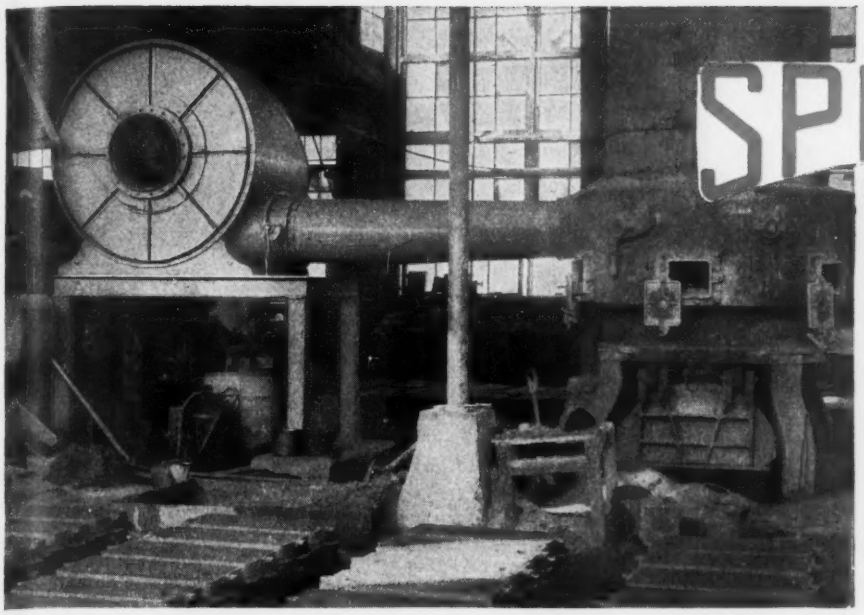

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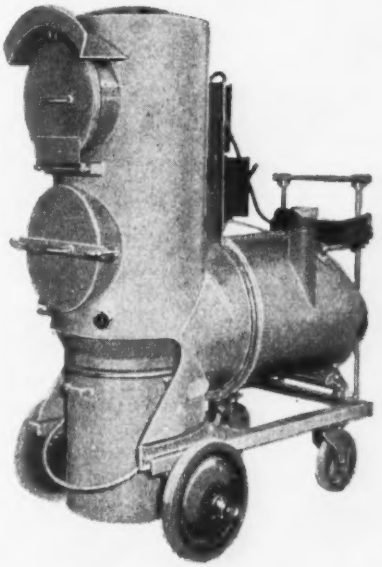
This dependability is built-in. With wide clearances, only two bearings to grease and an all-metal bridge-like construction, there is little that can go wrong even in the most severe and prolonged service.

Spencer Turbos are particularly noted also for their compact, light weight construction and comparatively quiet operation. They can be mounted anywhere—overhead, or on the floor without special foundations.

The control may be manual, by means of a calibrated ammeter and blast gate, or complete automatic air-weight control with recording charts may be used. Ask for the Spencer Foundry Bulletin No. 112.



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Spencer Industrial Portable Vacuum Cleaners are solving the housekeeping problem in all types of foundries, large and small. Periodic overhead cleaning, picking up molding sand and cleaning molds, patterns and finished castings are a few of the jobs that make Spencer Vacuum pay for itself in a few months. Bulletins on request.

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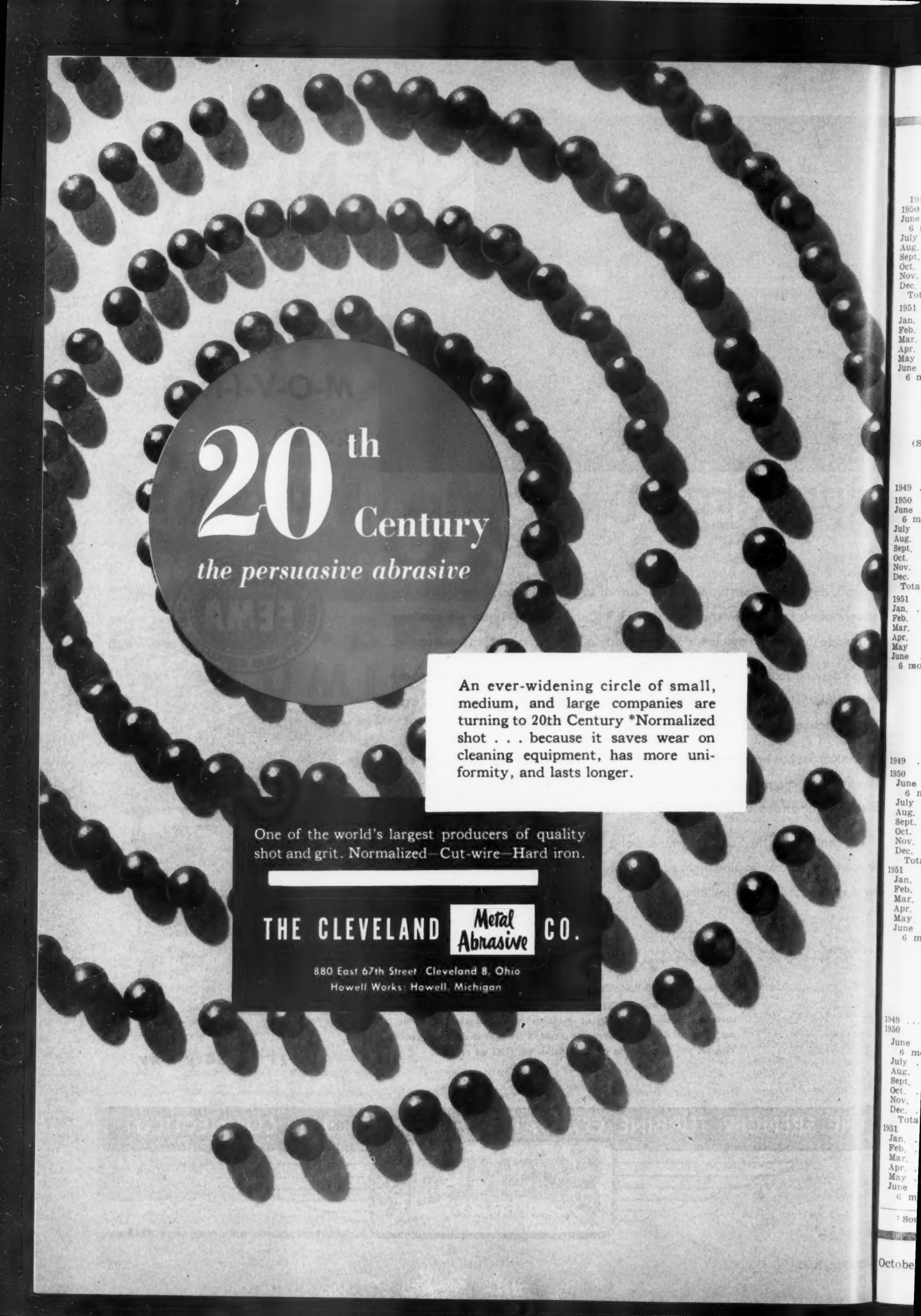
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Foundry STATISTICS

Malleable Iron

(Shipments of castings—net tons[1])

	Shipments—Total	Shipments—For Sale	Unfilled Orders[2]
1949	713,330	371,214	.....
1950			
June	82,345	46,613	86,783
6 mo.	417,847	228,130	.....
July	67,514	37,198	105,300
Aug.	86,021	50,019	132,374
Sept.	82,479	46,927	152,583
Oct.	89,968	50,157	160,278
Nov.	85,163	48,670	180,099
Dec.	91,510	51,091	194,950
Total	920,502	512,192	.....
1951			
Jan.	92,508	54,817	234,060
Feb.	88,950	54,915	255,347
Mar.	101,667	60,265	267,169
Apr.	97,276	57,554	276,463
May	100,800	61,373	274,954
June	93,745	56,545	255,531
6 mo.	574,946	345,469	.....

Copper-Base Alloy

(Shipments of castings—1000 pounds[1])

	Shipments—Total	Shipments—Sand	Shipments—Perm. Mold	Unfilled Orders[2]
1949	724,053	654,444	37,311	.....
1950				
June	83,023	74,990	3,896	32,808
6 mo.	453,598	408,973	23,254	.....
July	69,033	62,414	3,789	39,906
Aug.	94,013	85,948	4,258	52,513
Sept.	95,641	87,111	4,630	58,673
Oct.	105,746	96,911	5,064	66,560
Nov.	103,694	93,607	5,776	67,931
Dec.	100,548	90,513	5,985	69,569
Total	1,016,180	918,883	52,756	.....
1951				
Jan.	102,643	92,171	6,363	77,580
Feb.	96,946	87,667	5,427	75,967
Mar.	110,887	100,221	6,405	79,766
Apr.	101,506	91,852	5,802	82,711
May	105,438	95,049	5,986	84,002
June	98,559	88,818	5,358	83,518
6 mo.	615,979	555,778	35,341	.....

Aluminum

(Shipments of castings—1000 pounds[1])

	Shipments—Total	Shipments—Sand	Shipments—Perm. Mold	Shipments—Die	Unfilled Orders[2]
1949	304,409	106,825	102,908	87,812	.....
1950					
June	37,600	12,677	11,825	12,173	53,309
6 mo.	200,455	68,149	64,261	63,472	.....
July	30,152	9,613	9,808	9,943	63,892
Aug.	39,852	14,117	12,682	12,207	82,564
Sept.	42,061	14,369	13,085	13,594	89,723
Oct.	47,278	15,994	14,893	15,408	102,938
Nov.	46,816	16,099	14,040	15,715	67,931
Dec.	45,999	15,675	15,052	14,322	104,380
Total	452,610	154,013	143,821	144,661	.....
1951					
Jan.	42,538	14,401	14,554	12,641	93,264
Feb.	40,785	14,106	13,082	12,852	94,581
Mar.	42,204	15,900	12,771	12,677	100,453
Apr.	40,242	14,455	12,901	12,079	106,077
May	40,487	14,798	13,400	11,692	112,638
June	35,961	13,853	10,323	10,850	112,760
6 mo.	242,217	87,513	77,031	72,791	.....

Magnesium

(Shipments of castings—1000 pounds[1])

	Shipments—Total	Shipments—For Sale	Unfilled Orders[2]
1949	9,364	8,781	....
1950			
June	758	698	2,482
6 mo.	4,819	4,498	....
July	727	677	3,356
Aug.	1,147	1,078	4,855
Sept.	1,231	1,154	4,942
Oct.	1,354	1,297	5,573
Nov.	1,508	1,434	6,928
Dec.	1,528	1,444	6,958
Total	12,314	11,582	....
1951			
Jan.	1,840	1,739	8,616
Feb.	1,907	1,801	10,878
Mar.	2,156	2,058	12,196
Apr.	2,267	2,161	12,191
May	2,334	2,206	12,867
June	1,758	1,642	14,331
6 mo.	12,262	11,607	....

Foundry Production Workers

Estimated Number

	May 1951	Apr. 1951	May 1950
Gray Iron	162,500	163,500	132,700
Malleable	27,900	27,700	22,200
Steel	62,100	60,800	40,600
Nonferrous	92,900	93,200	73,600

Average Weekly Earnings

Gray Iron	$70.58	$71.04	$63.44
Malleable Iron	74.04	75.21	63.32
Steel	74.81	75.56	63.49
Nonferrous	74.07	73.69	65.36

Average Weekly Hours

Gray Iron	42.7	42.9	41.9
Malleable Iron	42.6	43.2	40.8
Steel	42.7	43.3	40.7
Nonferrous	42.4	42.4	40.9

Labor Turnover Rate (May)

(Per 100 employees)

	Total Accession	Total Separation	Quit	Layoff
Gray Iron	6.0	5.8	4.0	0.6
Malleable Iron	7.8	7.3	5.8	0.05
Steel	7.3	5.4	4.2	0.1
Nonferrous	6.8	4.5	2.8	0.7

Source: Bureau of Labor Statistics.

Gray Iron Castings—Shipments

(Net tons[1])

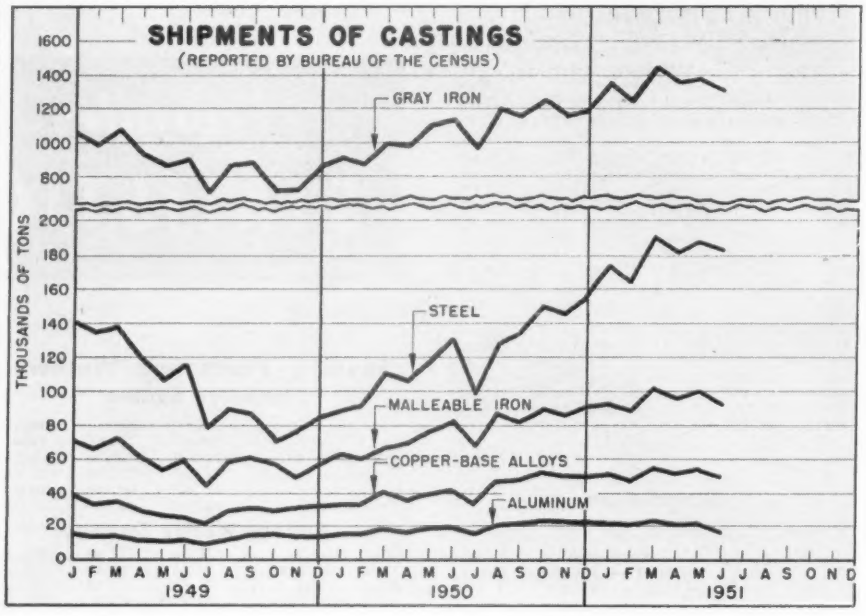
	All Castings—Total	All Castings—For Sale	Miscellaneous Castings—Total	Miscellaneous Castings—For Sale	Heavy Steel Ingot Molds—Total	Heavy Steel Ingot Molds—For Sale	Chilled Railroad Car Wheels—Total	Chilled Railroad Car Wheels—For Sale	Pressure Pipe & Fittings Total[2]	Soil Pipe & Fittings Total[2]	Unfilled Orders[2] Total
1949	10,549,284	5,521,441	6,624,420	2,675,411	1,776,242	759,860	555,569	493,117	1,029,743	563,310	.....
1950											
June	1,136,129	613,084	713,811	300,863	197,474	91,377	45,672	41,672	106,980	72,192	1,039,618
6 mo.	5,985,658	3,036,199	3,780,017	1,472,049	1,102,754	491,709	247,418	217,782	511,005	344,654	.....
July	961,450	507,867	595,918	241,632	177,154	82,363	35,066	30,560	94,438	58,874	1,286,579
Aug.	1,201,569	677,134	747,046	335,868	199,770	92,340	52,508	46,681	131,127	71,118	1,670,380
Sept.	1,159,240	648,966	722,667	325,019	203,191	94,968	44,707	40,304	121,556	67,119	1,794,118
Oct.	1,254,901	700,512	792,764	364,607	220,821	100,082	46,516	41,023	119,105	75,695	1,839,866
Nov.	1,160,770	656,745	733,570	343,073	194,271	85,057	44,382	40,068	115,465	73,082	1,930,176
Dec.	1,181,974	652,929	745,766	333,033	210,700	98,071	43,667	39,984	111,066	70,775	2,012,480
Total	12,905,562	6,880,352	8,117,748	3,415,281	2,308,661	1,043,590	514,074	456,402	1,203,762	761,317	.....
1951											
Jan.	1,364,311	762,407	875,437	405,863	228,824	103,475	56,046	49,065	131,779	72,225	2,297,705
Feb.	1,234,226	684,928	811,724	369,932	193,648	91,598	49,423	43,967	117,141	62,290	2,391,843
Mar.	1,440,149	818,473	920,802	427,162	231,853	114,858	62,282	57,241	144,620	74,592	2,389,659
Apr.	1,363,041	766,735	880,381	403,619	217,970	106,417	61,993	54,002	134,302	68,395	2,336,926
May	1,396,236	796,053	897,913	418,950	225,129	112,145	65,721	57,485	139,854	67,619	2,228,596
June	1,308,613	742,420	846,650	394,955	216,620	108,042	58,620	52,700	121,851	64,872	2,162,023
6 mo.	8,106,576	4,571,016	5,232,907	2,420,481	1,314,044	636,535	354,085	314,460	789,547	409,993	.....

Steel Castings—Shipments

(Net tons[1])

	All Castings—Total	All Castings—For Sale	All Castings—Railway Specialties	Carbon Steel—Total	Carbon Steel—For Sale	Carbon Steel—Railway Specialties	Alloy Steel—Total	Alloy Steel—For Sale	Alloy Steel—Railway Specialties	Unfilled Orders[3] Total
1949	1,250,460	865,297	232,976	944,232	659,454	223,310	299,270	205,843	9,666	.....
1950										
June	131,097	94,637	27,065	96,365	72,427	24,653	34,732	22,210	2,412	206,799
6 mo.	648,425	451,244	100,522	478,396	334,617	91,796	170,029	116,627	9,726	.....
July	98,269	68,874	15,734	70,122	51,204	14,577	28,147	17,670	1,157	255,418
Aug.	128,369	94,413	24,922	92,197	70,721	22,952	36,172	23,692	1,970	329,944
Sept.	134,574	96,738	25,295	98,523	74,052	23,992	36,051	22,686	1,303	427,969
Oct.	149,558	109,660	30,048	112,704	85,157	28,493	36,854	24,503	1,555	521,846
Nov.	145,929	108,263	30,775	110,476	84,316	29,245	35,453	23,947	1,530	537,666
Dec.	155,258	113,692	34,061	118,744	88,552	32,160	36,514	25,140	1,901	554,187
Total	1,459,382	1,042,884	261,357	1,081,162	788,619	243,215	379,220	254,265	18,142	.....
1951										
Jan.	174,056	124,002	42,805	135,086	98,197	37,790	38,970	25,805	5,015	675,385
Feb.	163,976	117,156	42,565	126,293	93,461	36,793	37,683	23,695	5,772	706,989
Mar.	190,665	134,184	44,196	148,884	107,745	39,492	41,781	26,439	4,744	779,717
Apr.	181,908	129,059	41,545	139,948	102,367	37,553	41,960	26,692	3,992	846,947
May	189,232	131,102	39,845	143,201	101,363	35,511	46,031	29,739	4,334	881,702
June	184,658	131,453	42,317	141,538	103,090	38,200	43,120	28,363	4,117	895,054
6 mo.	1,084,495	766,956	253,273	834,950	606,223	225,339	249,545	160,733	27,974	.....

[1] Source: Bureau of the Census. [2] All cast iron pipe is shipped for sale. [3] For sale only.



Index of Foundry Equipment Orders

Foundry Trades Only

(Net Orders Closed, New Equipment)

	1950	1951
Jan.	159.3	668.6
Feb.	113.1	638.6
Mar.	225.2	599.0
Apr.	160.6	490.1
May	294.9	431.7
June	622.7	393.2
July	401.8	390.3
Aug.	693.6	...
Sept.	483.8	...
Oct.	526.8	...
Nov.	885.5	...
Dec.	526.2	...

Note: Figures are percentages of the base period 1937-1939 taken as 100 per cent (monthly average). Source: Foundry Equipment Manufacturers Association.

Coke Production and Consumption

(Net tons*)

	Production	Consumption Total	Consumption By Foundries
1949	63,637,429	63,462,233	2,778,868
1950			
July	6,368,489	6,265,821	267,142
7 mo.	39,916,682	40,905,080	1,812,532
Aug.	6,417,404	6,420,483	278,306
Sept.	6,263,214	6,243,584	274,657
Oct.	6,649,935	6,543,428	332,444
Nov.	6,243,970	6,131,733	317,120
Dec.	6,606,464	6,590,823	322,450
Total	72,097,669	72,735,131	3,337,517
1951			
Jan.	6,791,828	6,766,767	330,698
Feb.	6,001,538	6,036,774	293,169
Mar.	6,692,460	6,693,661	299,196
Apr.	6,484,258	6,354,400	356,816
May	6,747,163	6,732,825	368,511
June	6,574,621	6,645,155	330,924
July	6,634,503	6,500,221	300,978
7 mo.	45,926,371	45,729,803	2,280,283

Ingot Brass and Bronze

(Shipments in net tons)

	1950	1951
Jan.	18,874	28,416
Feb.	18,487	27,168
Mar.	22,494	31,997
Apr.	22,118	30,472
May	23,643	33,267
June	25,093	33,817
July	21,609	32,016
Aug.	29,689	.....
Sept.	28,811	.....
Total for year	303,563	.....

Zinc-Base Alloy

(Shipments of castings—1000 pounds[1])

	Shipments Total	Shipments For Sale	Unfilled Orders[2]
1949	377,779	248,679	.....
1950			
6 mo.	250,218	158,267	.....
Total	536,398	341,833	.....
1951			
Feb.	38,964	25,307	93,605
Mar.	44,218	27,959	100,652
Apr.	43,513	28,565	101,949
May	44,187	29,092	100,299
June	41,341	28,278	95,174
6 mo.	253,389	166,847	.....

Iron and Steel Scrap Consumption

(Thousands of gross tons*)

	All Scrap Total	All Scrap Purchased	By Type of Furnace: Cupola Total	Cupola Purchased	Air Total	Air Purchased	Electric Total	Electric Purchased
1949	49,281	22,922	7,968	4,175	801	276	4,239	2,608
1950								
Apr.	5,119	2,451	766	365	79	29	493	300
4 mo.	19,665	9,297	2,913	1,389	308	112	1,830	1,108
May	5,333	2,552	837	416	85	32	539	324
June	5,122	2,483	864	427	92	33	533	317
July	4,708	2,244	669	318	79	28	490	295
Aug.	5,202	2,454	862	426	108	39	568	327
Sept.	5,170	2,468	819	404	109	40	579	348
Oct.	5,643	2,707	866	437	108	40	643	384
Nov.	5,293	2,598	841	431	107	39	593	364
Dec.	5,361	2,600	803	418	122	44	600	361
12 Mo.	61,497	29,403	9,474	4,666	1,118	407	6,385	3,828
1951								
Jan.	5,975	3,010	1,009	534	110	41	684	436
Feb.	5,338	2,692	937	492	101	38	627	399
Mar.	6,188	3,101	1,064	559	109	39	728	463
Apr.	5,988	3,014	...	...	...	...	...	...
4 mo.	23,489	11,817	...	...	...	...	...	...

Pig Iron Production and Consumption

	Production** (Standard grades—1000 net tons) Total	Foundry	Malleable	Basic	Low Phos. Intermediate Low Phos. & Bessemer	Consumption* (By type of furnace, 1000 gross tons) Total	Cupola	Air	Electric
1949	53,408.7	2,821.9	2,294.5	41,312.5	6,979.8	47,928	4,510	235	96
1950									
July	5,804.2	269.3	282.2	4,561.2	691.5	5,018	403	23	11
7 mo.	36,505.8	1,618.5	1,607.0	28,653.0	4,626.3	33,084	3,085	158	149
Aug.	5,706.2	257.0	284.0	4,407.3	757.9	5,136	516	30	18
Sept.	5,614.6	244.0	257.2	4,380.9	732.5	5,092	500	26	17
Oct.	5,836.8	284.1	260.6	4,541.2	741.0	5,219	466	31	13
Nov.	5,316.5	277.1	279.1	4,093.7	666.6	4,817	462	30	14
Dec.	5,609.2	264.9	260.2	4,374.4	709.8	5,068	456	34	15
12 Mo.	64,589.1	2,870.4	3,034.2	50,450.5	8,234.0	58,416	5,475	319	326
1951									
Jan.	5,801.7	300.0	233.3	4,529.8	738.6	5,367	542	32	11
Feb.	5,084.8	238.7	226.0	4,007.2	612.9	4,725	492	29	10
Mar.	5,919.3	267.9	276.5	4,647.5	727.5	5,406	550	33	15
Apr.	5,812.2	259.1	261.0	4,575.8	716.1	5,281	...	..	..
May	6,104.9	282.0	259.4	4,777.0	786.5	....	...	..	..
June	5,911.3	254.2	276.5	4,631.9	748.7	....	...	..	..
July	5,994.8	280.4	250.0	4,702.8	761.6	....	...	..	..
7 mo.	40,628.0	1,882.3	1,782.7	31,971.5	5,091.9	....	...	..	..

* Source: U. S. Dept. of Interior, Bureau of Mines. ** Source: American Iron & Steel Institute. [1] Source: Bureau of the Census. [2] For sale only.

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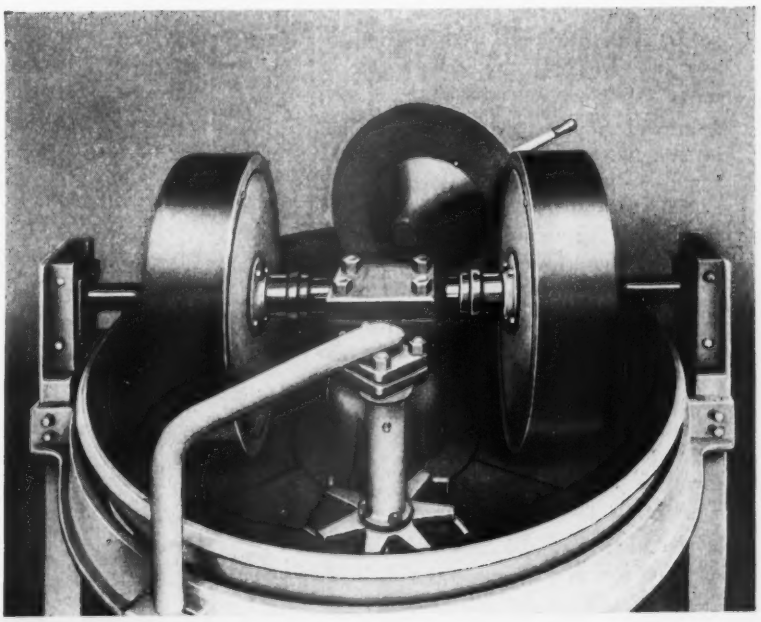

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D3081

Study of Metal Flow In Sand Molds

(*Continued from page* 109)

it was placed on the end. The mold was tipped approximately the same height (2½ inches) as it would have been if made in the foundry (Fig. 21B).

Gate—Same as Experiment 5. *Head*—One on end, highest point in mold. *Mold tipped*—Equivalent 2½ in. with head up. *Pouring time*—0.18-minute, very slow.

Flow pattern—First metal evolved in a very violent action. It flowed downward to lowest part of mold and filled gradually toward head.

Inclusions—First metal introduced some inclusions which were trapped at the outside circumference at the lower cope surface (Fig. 21A). Other inclusions were found around near the upper head at the highest point in the mold. *Special note*—As metal evolved from gate orifice it was constantly striking the center of the cope surface and produced a mushroom effect. It was apparent that severe erosion would occur if the casting were made similarly in the foundry.

All four transparent molds were used for the experiments, but the same results could be accomplished with one mold to which the various gating arrangements could be attached or "stopped off". Material used for the four molds and the cost follow:

Description	Price
One sheet Lumarith cellulose acetate, transparent, 20 x 26 x $\frac{1}{16}$-inch	$3.50
One sheet Tenite 2 cellulose acetate, transparent tubing, $\frac{5}{16}$-in. in diam, 24 in. long	.27
One piece, same as above, ¾-in. in diam, 24 in. long	.66
One piece Lucite acrylic transparent tube, 6 in. long.	2.00
One tube plastic transparent cement, 2 oz.	.20
	$6.83

Other materials used to construct the molds are usually at the disposal of most metallurgical laboratories, and include 5 lb of mercury (which can be reclaimed); one stop watch, and one small funnel with stopper attachment. Actual construction of the molds, including the layouts, were made by a patternmaker. Approximate time for labor was two hours. Results were computed by a laboratory technician, and the approximate time for computing and evaluating was two hours. Some of the materials are shown in Fig. 15.

Results of the experiments showed

that two of the best functioning gates for the particular casting design are obvious. They are the swirl gate not tipped with the head in the center, and the bottom gate not tipped with the head in the center. However, in actual foundry practice the swirl gate would be the least expensive in molding costs and saving in metal. The swirl gate would cause more erosion of the sand. The bottom gate would give more uniform temperature gradient in the mold. Direct gate would be the most turbulent and erosive. Gas evolution has not been mentioned in the experiments because it requires a little deviation in procedure. However, the same experimental molds may be used to determine this factor.

Acknowledgements — Appreciation is expressed to the following, without whose help this work would have been impossible: Walter W. Moore, works manager, Sam Belus, chief inspector, Steve Belus, pattern shop foreman, Burnside Steel Foundry Co., Chicago, and George A. Davis, foundry instructor, Crane Technical High School, Chicago.

This method of metal flow study is covered by pending patent applications.

Foundry Hires Displaced Men from Europe

To obtain foundry labor in sufficient numbers to expand operations, Grede Foundries Inc., Milwaukee, recently arranged to hire 100 displaced single men from Europe. The arrangements were made through the United States government.

A group of 49 shipped from Bremerhaven, Germany, on Aug. 22. From New York they went directly to Milwaukee to take jobs in Grede foundries in that area. The remainder of the 100 will arrive in a few weeks. Single men were selected to minimize the housing problem.

The men, most of whom are under 25 years of age, are being sponsored by Grede because the company has been unable to hire sufficient workers for increased operations. The immigrants are unskilled but have expressed interest in foundry work. They are screened by the United States Displaced Persons Commission. The men are natives of Poland, Hungary, Germany, Czechoslovakia and Rumania.

Grede has a total employment of about 1000 in its six divisions—three in Reedsburg and one in Iron Mountain, Mich.

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2 cu. ft.
5 cu. ft.
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30 cu. ft.
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Norwegians Profit from Tour of Foundries

The 18-man productive team from Norwegian foundries, which in the spring of 1950 visited 28 American plants on an ECA-sponsored study tour, has made public a 10-point program which outlines its conclusions.

Among the recommendations offered for application in Norwegian foundries are these: Establishment of approved price and cost estimate standards; more money for training of foremen; greater wage differentials between skilled and unskilled workers; introduction of contract systems which reward higher output; permission to employ more unskilled workers than before.

With regard to conditions in the foundries, the report suggests better teamwork; better planning; better qualified technical supervisors; and more understanding on the part of management.

Urging improved technical facilities and raw materials, the report also calls for greater attention to hygiene and health conditions, and not least, to welfare and humanitarian provisions.

Summarizing its lessons from the United States, the Norwegian foundry group observes: "A new mental attitude must be developed. It is the individual worker who sets the pace; his personal effort, industry and pride in a job well done, are of decisive importance. But increased output must be accompanied by higher wages. After the contract terms have been fairly and firmly fixed, a worker should have the opportunity to earn as much as he can, thus benefiting himself as well as the plant. The greater his output, the more he can buy. And no organized group should be permitted to interfere with the volume of his output. That is a matter between him and the management."

New Film on Coremaking

Archer-Daniels-Midland Co., Foundry Products Division, 2191 West 110th St., Cleveland 2, has produced a half-hour, color, sound, 16-mm, motion picture entitled "The ADM of Cores." It is a semitechnical discussion of basic foundry core practice. Purpose of the film is to bring about a better understanding of fundamental characteristics of core sands and core binders, thereby enabling foundries to improve the efficiency of all phases of core production. Prints may be borrowed without cost.

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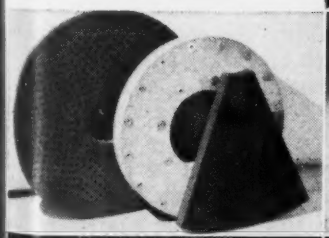

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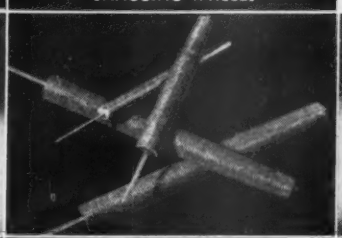

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How to use the CUPOLA

By BERNARD P. MULCAHY
President
Fuel Research Laboratory Inc.
Indianapolis

Continuing his discussion of the air system, the author describes balanced blast and hot blast cupolas and dehumidification of the blast. This is the tenth article of a series

UP TO this point we have treated the subject of the cupola air system as it relates to the majority of operations—namely, cold blast and with conventional single row of tuyeres. We are, however, interested in knowing what changes take place in an operation when certain blast modifications are introduced. These are briefly discussed.

Two Rows of Tuyeres — As generally constructed the second row of tuyeres, which vary in number and size but smaller than the main tuyeres, are located 10-12 inches above the bottom row. Use of the second row of tuyeres is generally employed to modify some inherent difficulty with a particular operation. They do help under certain conditions, but in the writer's opinion the difficulty can generally be corrected without their installation.

The general effect of the second row of tuyeres is to introduce oxygen higher in the bed, necessitating the maintenance of a higher coke bed to offset this condition. Higher temperatures result from this higher bed. It has also frequently been noticed that localized burn-out of the lining occurs directly above each upper tuyere in the form of a crater, indicating localized zones of increased activity. This is contrary to what we want to accomplish, in that our objective is to maintain uniform combustion across the entire bed area.

Balanced Blast — The balanced blast cupola, which is a conventional cupola with a special tuyere arrangement, consists of three rows of tuyeres, with the tuyeres in each row smaller in size than in the previous row below. Each tuyere in the bottom row is equipped with a valve for periodically shutting off the blast in one or more tuyeres. The claims for this cupola are greater economy by virtue of a higher CO_2 production in the waste gases. It is difficult to reconcile the claims and the conclusions for this process with the fundamentals of the combustion within the cupola. Actually the same stage of combustion, namely, a higher-than-normal CO_2 content of the stack gases can be accomplished in the conventional cupola by thinning the coke ratio and increasing the air.

It is claimed that the CO initially formed is burned to CO_2 by the oxygen introduced through the second and third row of tuyeres, thus releasing additional heat. This certainly is possible; however, by elevating the tuyeres above the normal zone free oxygen exists at a point higher than in a normal cupola, and this oxygen must be consumed before the gases leave the top of the operating bed, or oxidized iron will result. The same correction must be applied as in normal cupola, namely, raising the coke bed so that the free oxygen will be consumed. Any normal cupola can be run to produce a high CO_2 content in the stack gases by operating with a thin coke ratio and a high air rate.

One desirable feature of the balanced blast cupola has been the control valves on the lower tuyeres which when operated on a cycle of periodic closure, will result in minimizing "bridging" conditions.

In the writer's opinion, with the exception of the control valves, the performance of the balanced blast cupola can be equalled by any other well designed and well operated conventional cupola with a single row of tuyeres.

Hot Blast —The hot blast cupola is designed for either internal or external heating. By internal is meant the extraction of the heat from the stack gases. Obviously this system will permit greater fuel economy than the cupola operating where the stack gases are lost to the atmosphere.

One type burns the residual CO in a stove to preheat the air passing through tubes, while in a second type of internal hot blast the air is conducted through a series of pipes in the section of the cupola below the door to preheat it by means of the sensible heat in the gases. No stack gases are burned in this process.

The external system employs a second source of fuel to preheat the air entering the cupola. In this instance, the overall thermal efficiency is reduced by virtue of consuming additional fuel.

The relative merits of either type of hot blast is strictly a question of economics of initial cost, maintenance and resulting efficiency in melting.

The benefits of the hot blast system on the cupola operation (disregarding investment costs) is unquestioned. "Bridging" in the cupola is reduced to a minimum. Better coke ratios are possible, which permits faster melting and higher temperatures are easier to maintain because of a cleaner cupola throughout the heat.

Dry Blast or Dehumidification — In recent years attention has been directed toward the effect the varying moisture content of the air has on cupola operation and metal characteristics. For normal atmospheric pressure the percentage by volume of moisture in saturated air can vary from 0.6 per cent at 30°F to 6.5 per cent at 100°F. At an air rate of 10,000 cfm this would be equivalent to 2.5 lb. of water per minute at 30°F and 33 lb. of water per minute at

(*Continued on page* 207)

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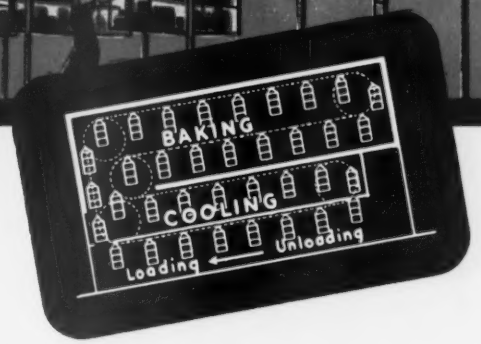

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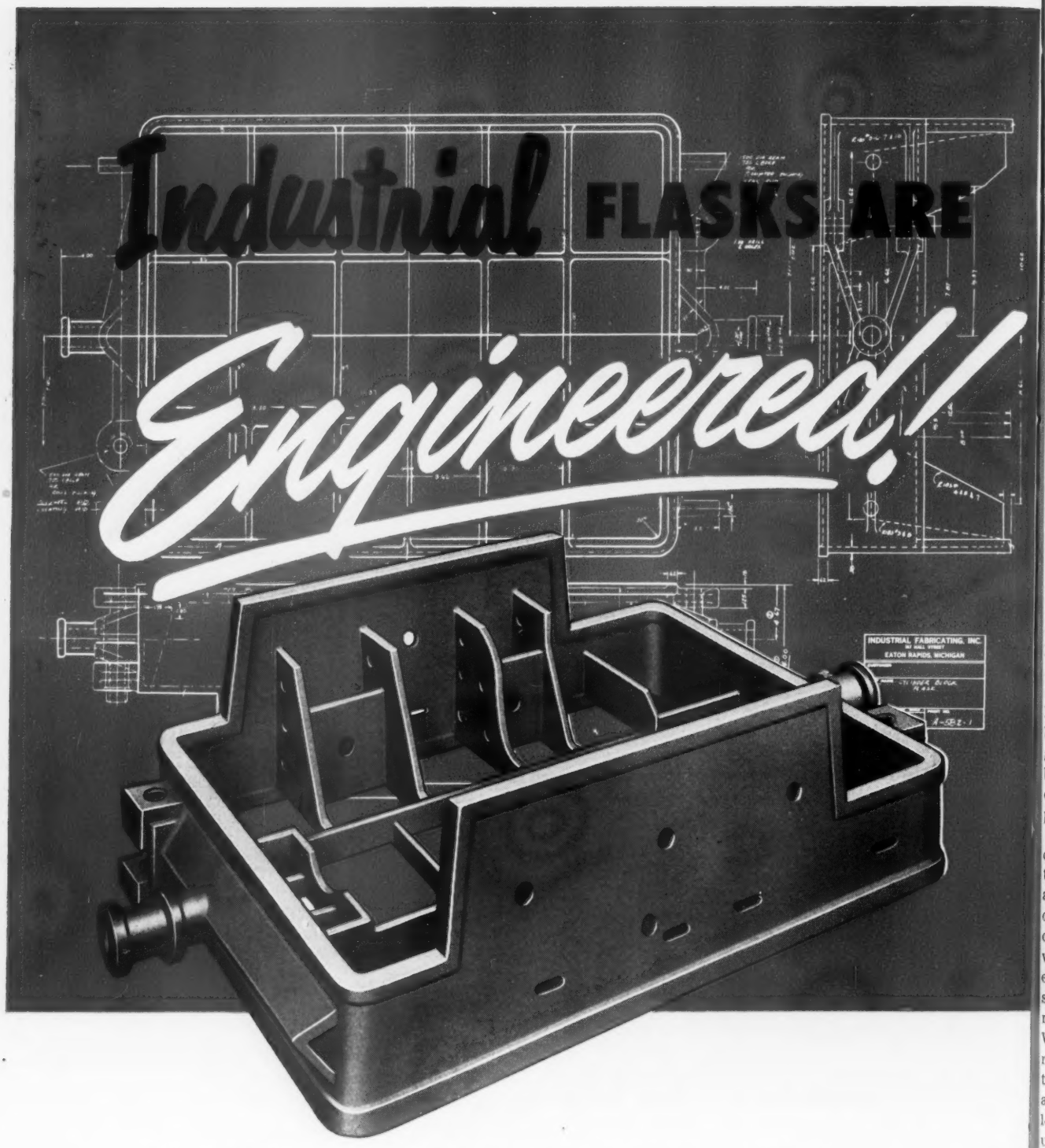

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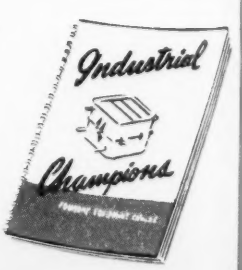

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(*Continued from page* 204)

100° F. Unquestionably this variation in moisture content which is possible in year-around operation exerts some influence on cupola operation. Additional coke is required at the high moisture content level because of the heat required for dissociation of the water, and it is further claimed that the hydrogen originating from the water gas exerts an adverse effect upon the metal properties.

Plants using dehumidification systems have generally felt that they have been beneficial to their operation. The decision with respect to the use of this equipment, however, is still largely a question of the potential benefits vs. the investment and operating costs, and the writer feels that the full benefits possible with the conventional cupola should first be obtained by rigorously adhering to the well established methods of exact control.

Air Rate vs Melting Rate — Referring to the chart presented in the previous article (September, p.156) we call attention to the fact that if we hold the coke ratio constant, the melting rate will increase at a given rate with an increase in the air rate. However, there is a practical limit beyond which we cannot go without getting into trouble with the iron because of the limiting features of combustion conditions and cupola capacity.

Frequently a shop practice is encountered where the cupola is made to carry the entire burden of a variable shop demand. Within the limit of the melting rate capacity of the cupola this is satisfactory; however, when a reasonable capacity is exceeded trouble with the metal from one source or another will unquestionably result, with potentially higher losses. When a slower-than-normal melting rate is required, it is almost certain that the metal temperature will drop, again resulting in a higher potential loss unless, of course, excess coke is used.

For best cupola operation, therefore, a reasonable and constant melting rate should be determined and set for a given cupola. In most instances the work in the shop can actually be adjusted for this reasonable rate and benefits of constantly good metal will justify this adjustment.

Air Rate vs Coke Ratio — Again referring to the chart we note that with air rate held constant an increase in coke will cause a decrease in melting rate.

When the operation is in an uncertain state of balance and a persistent drop in metal temperature has occurred or occurs regularly each day

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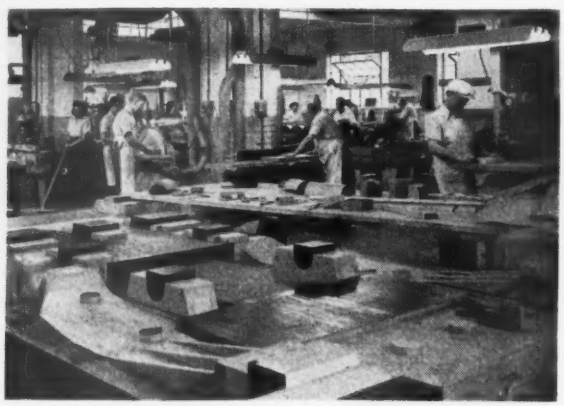

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at a certain time, the quickest correction is to reduce the air rate. If the temperature drop has been due to a lowering of the bed because of insufficient coke the metal temperature will recover. In the meanwhile a "coke booster" should be added and coke per charge increased. When these reach the bed the air can be raised to its original level.

Too much coke can also cause a temperature drop but this will be accompanied by a slower melting rate, and the carbons may be higher than desired. A correction would be to initially increase the air until the temperature recovered, followed by a reduction in both air and coke until proper conditions have been established.

Air Variation to Control Carbon — Here we have a specific example of holding all other conditions constant but varying the air. When conditions in the cupola are within a practical balance it is possible within certain limits to increase the air and lower the carbon in the iron and, conversely, to decrease the air to raise the carbon in the iron. In effect this raises and lowers the percentage of CO_2 produced, or in other words, increases and decreases the state of oxidation within the cupola.

Control of carbon by this means should be used with extreme caution because if conditions are balanced within the cupola and the air rate increased, it is entirely possible that momentarily the carbon in the iron will be adjusted to the desired analysis but will be followed by a loss in temperature and an undesirable state of oxidation, resulting from a lowering of the bed. It is not good practice to vary the air upward or downward during a heat, except in searching for a better adjustment. It would be better to rebalance the composition of the metal mix and then find the proper balance of air and coke to maintain the analysis which is desired.

Excess Air — Frequently the writer has encountered conditions where the blower has a capacity considerably in excess of the melting rate of the cupola to which it is attached. With no metering equipment the operation has been adjusted by adding coke until all of the surplus air is satisfied. The net result of such an operation, of course, is high coke costs, slow melting rate, and difficulty in maintaining desired analyses, particularly if high-strength iron of low-carbon content is desired. In this instance, it would be much cheaper to install a reliable meter and establish the correct amount of air and coke required. The cost of the meter

(*Concluded on page* 211)

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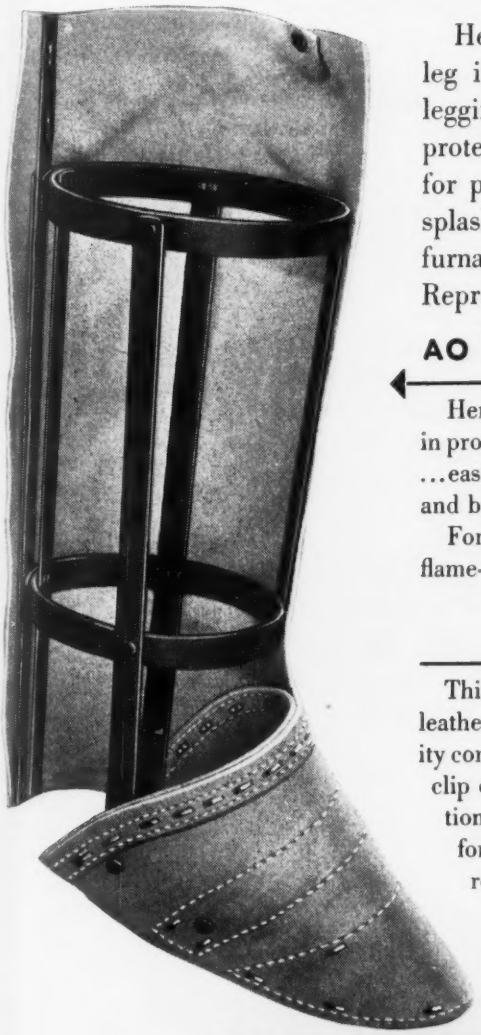

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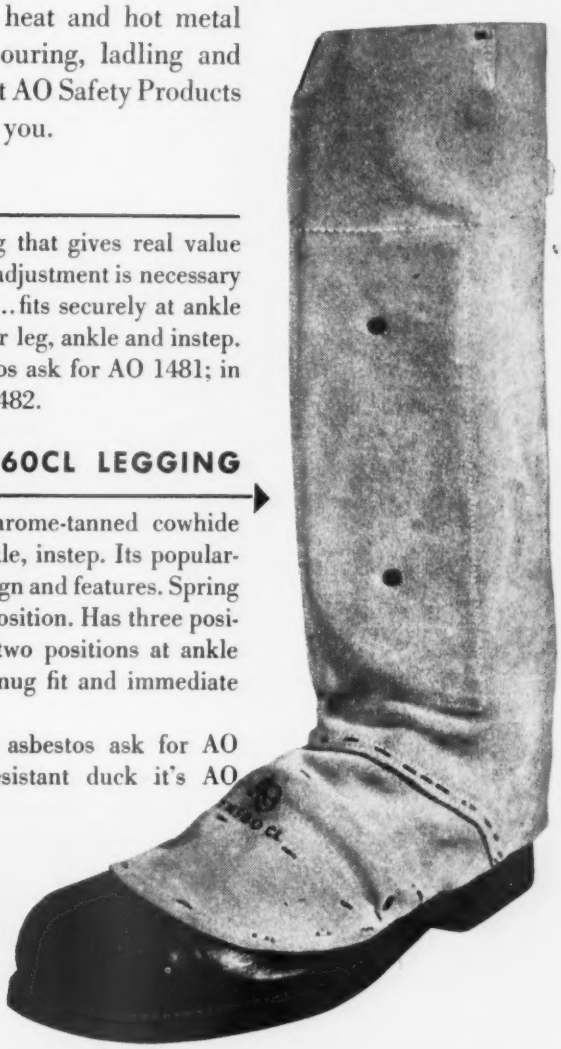

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(*Concluded from page* 208)

can easily be justified on the basis of overall savings.

If the higher amount of coke is not added to use up the surplus air, oxidation of the metal must result with consequent bad iron and high shop losses.

Insufficient Air — Very frequently the blower has insufficient capacity for the cupola to which it is attached. As the shop demand increases the only way in which more metal can be obtained is to decrease the coke per charge or to extend the length of the heat. Thinning the coke ratio may result in oxidation and lower metal temperatures with consequent increase in scrap. If the length of the heat is extended, overtime costs increase. In either event, the cheaper and more satisfactory correction is a larger blower.

Under present day conditions, where higher coke quantities are required, many blowers have not had the reserve capacity to permit the adjustment dictated. It is advisable, therefore, to correct such a condition; again the cost of the larger blower can be quickly absorbed in the improved condition of melting.

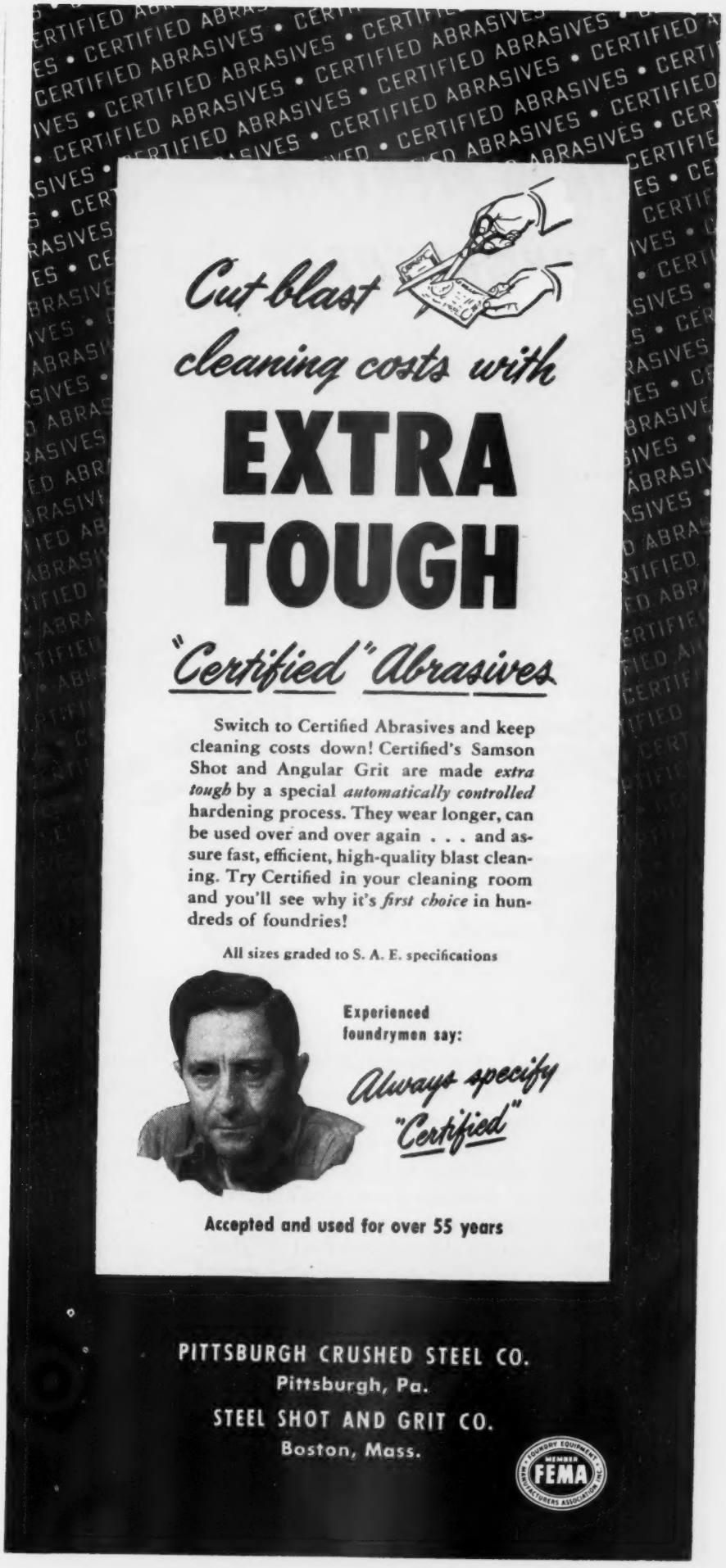
(*To Be Continued Next Month*)

Book Review

ASTM Standards on Copper and Copper Alloys, paper, 542 pages, 6 x 9 in., published by the American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. Price $4.35.

Published in January, 1951, this latest edition brings together in convenient form for industrial use 108 ASTM Standards on copper and copper pipe and base alloy products by Committee B-5 on Copper and Copper Alloys, Cast and Wrought, and other ASTM technical committees. Book is divided into five sections of which the first contains 20 specifications on copper, copper alloys and copper-covered steel wire, rods, bars and stranded conductors for electrical purposes. This is followed by a section of 13 specifications on various nonferrous such as slab zinc, nickel, silicon copper, lead, and others.

Then come several sections containing 63 specifications on such products as plate, sheet, strip; wire, rods, bars, shapes; pipe and tubes; sand and die castings; arc-welding electrodes and brazing solder. The book also contains ten test methods relating to tension, micrographs, hardness, etc. Also included are two recommended practices on preparing tension test specimens for copper-base alloys for sand castings, and designating significant places in specified limiting values.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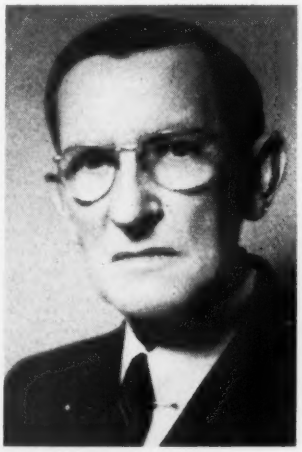
OBITUARY

JOHN C. Phelan, 72, vice president, Benjamin Eastwood Co., Paterson, N. J., died there Aug. 20, following a long illness. A native of St. Catherines, Ont., he attended Canadian schools and was graduated from Canisius College, Buffalo. Mr. Phelan who had been associated with the East-



JOHN C. PHELAN

wood casting and pattern company for 51 years, was a past president of the New Jersey Foundrymen's Association.

♦ ♦ ♦

William C. Zimmerman, 74, co-founder and retired president, Aluminum Match Plate Corp., Buffalo, died Aug. 11, at his home in Tonawanada, N. Y. Mr. Zimmerman was president of the company from the time he helped found it in 1933 until he retired three years ago.

♦ ♦ ♦

Clifford S. Blackburn, 59, sales manager, Buckeye Foundry Co., Cincinnati, died there Aug. 9. Mr. Blackburn, who had been associated with the company for many years, was a member of the Cincinnati District Chapter of the American Foundrymen's Society.

♦ ♦ ♦

Michael F. Murphy, for 30 years a representative of Bloomsbury Graphite Co., Bloomsbury, N. J., died Sept. 7, in Brooklyn, N. Y. Prior to joining the company as a salesman, Mr. Murphy had been active in the foundry industry as a molder.

♦ ♦ ♦

George J. Degginger, 66, co-owner, Degginger's Foundry, Topeka, Kans., died at his home there July 31. Mr. Degginger was born in Arlington, Kans., and the family moved to Topeka two years later. He had been in the foundry industry there from the age of 14, and was formerly superintendent of Magnus Metal Division, National Lead Co. In 1927 he

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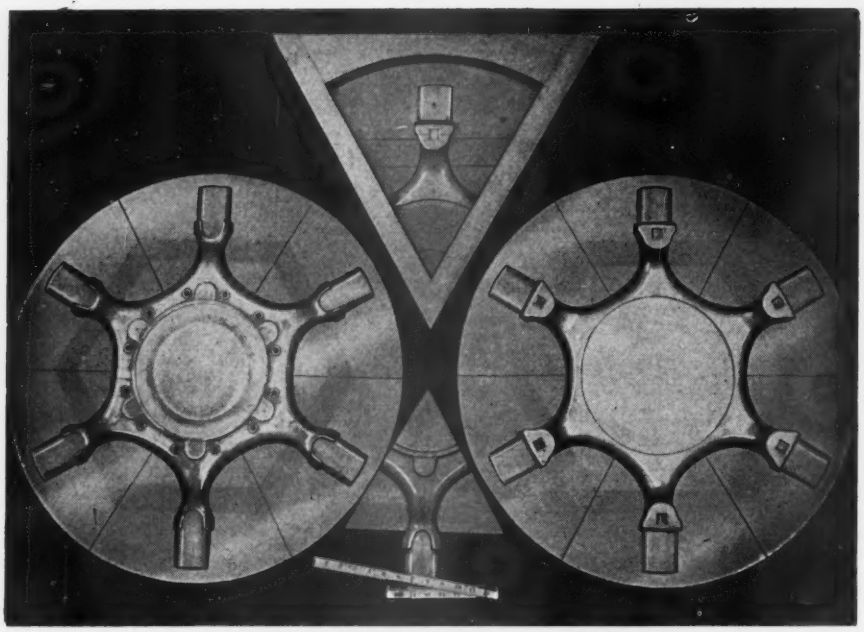

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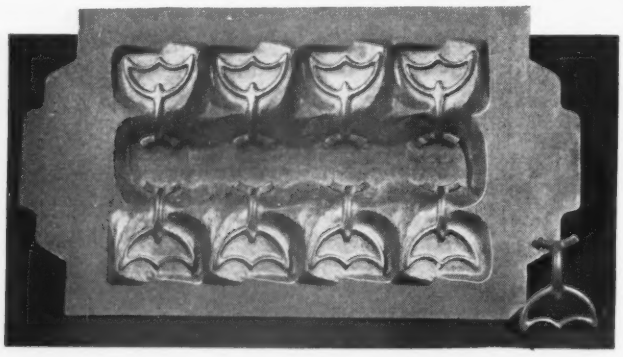

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formed his own company, the Castrite Foundry, and in 1946, with his son, Tim F. Degginger, started Degginger's Foundry.

♦ ♦ ♦

Wilbur D. Hockensmith, 73, president and chairman of the board of directors, Hockensmith Corp., Penn, Pa., died Aug. 19. A graduate of University of Pittsburgh, Mr. Hockensmith had been a university trustee since 1935.

♦ ♦ ♦

Edward Hettinger, 65, formerly superintendent, Gilbert Brass Foundry Co., St. Louis, died Aug. 24. Mr. Hettinger, who had been associated with the company for 40 years, retired 4 years ago.

♦ ♦ ♦

William F. Runnels, 86, died Aug. 9 in Newburyport, Mass. Mr. Runnels was for many years operating head of the former Albert Russell & Sons Co., iron and bronze foundry in Newburyport.

♦ ♦ ♦

William A. Coryea, 58, project manager, the Rust Engineering Co., Pittsburgh, died Aug. 13 at his home in Mt. Lebanon, Pa.

♦ ♦ ♦

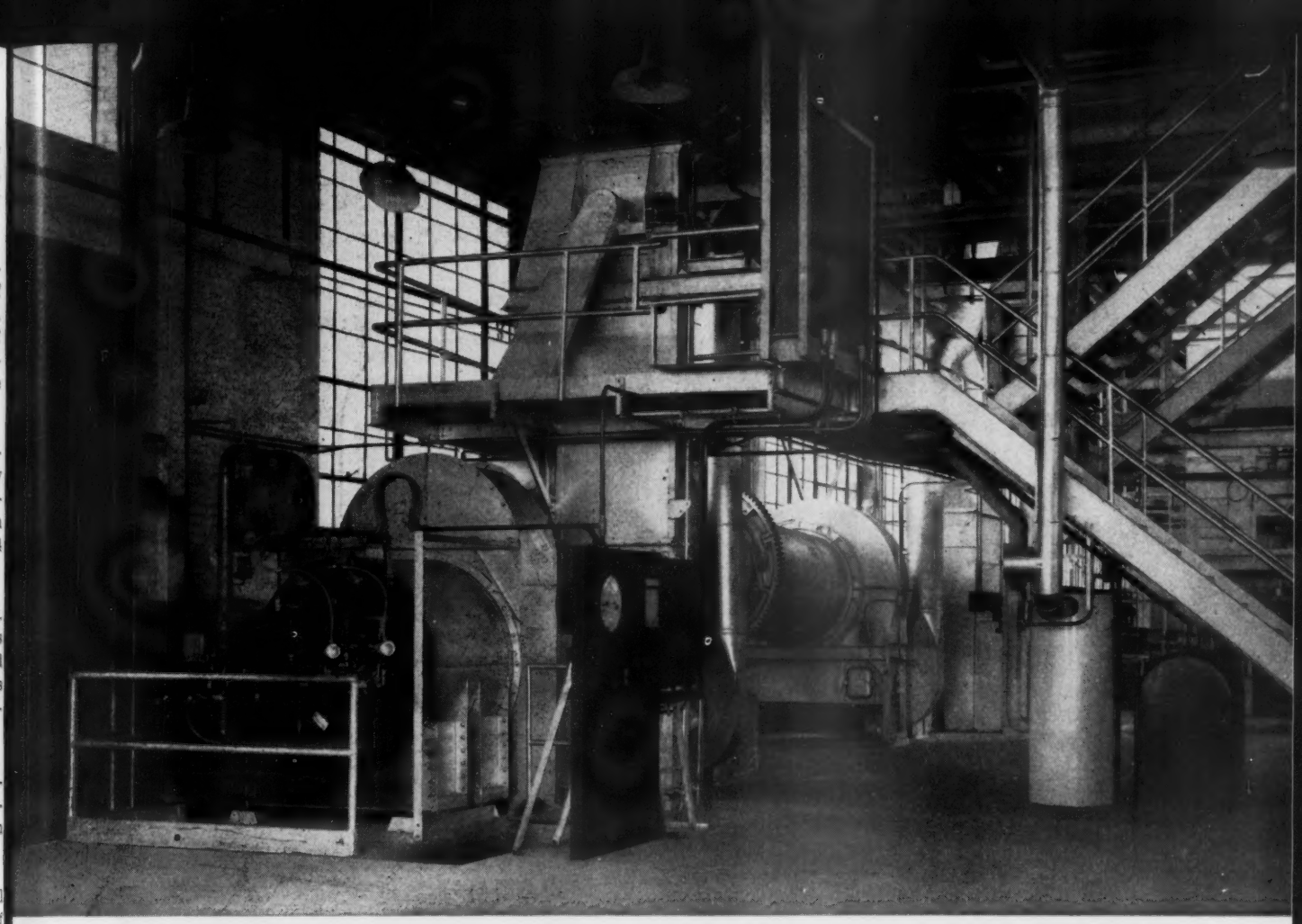
Albert J. Bell, 73, founder of Bell Bros. Co., smelters and refiners of nonferrous metals, died Aug. 22 at his Pittsburgh home.

Traces Company's Growth

Story of the growth and expansion of Kaiser Aluminum & Chemical Corp., Oakland, Calif., is depicted in a brochure, illustrated in color, recently issued by the company. Beginning with the exploration for new bauxite sources in Jamaica, British West Indies, the book depicts scenes at company plants in Washington, California, Ohio, Maryland and Louisiana. Research operations to improve production methods and to develop uses for products, are also illustrated. Outline is given of the company's history, from its inception in 1940, to its present system which includes 14 facilities.

Offers New Booklet

Data on technical developments in the field of cast-weld construction, citing numerous examples of impressive metals conservation, production economies, improvements in functional design, and other engineering gains, is being offered in booklet form by Steel Founders' Society of America. Copies are available from F. Kermit Donaldson, executive vice president of the society, 920 Midland Bldg., Cleveland 15.



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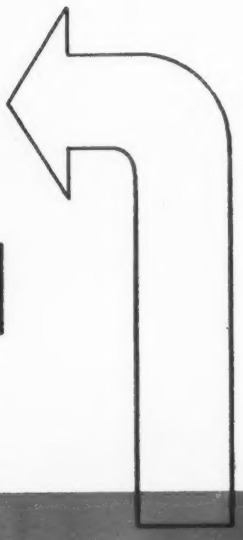

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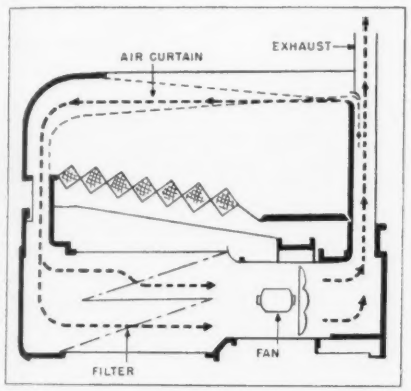
By EDWIN BREMER

Foundry DEVELOPMENTS

APPLICATION of an air curtain to obtain more effective dust removal from a casting cleaning or fettling booth is shown in the accompanying illustration from a paper by Ottignon and Lawrie which was presented at the annual meeting of the Institute of British Foundrymen. As indicated in the sketch, the air for the curtain is taken from the exhaust through a narrow slot 17 x 3/16-in. and is directed across the top of the booth at a velocity of 2000 fpm. Higher velocities create turbulence, permitting dust to escape at the top of the booth. Two cotton-wool filters are used and have a life of three to six days dependent upon the condition of the castings being cleaned. According to the authors, the air curtain materially assists in keeping the volume of exhaust air down to a low figure—600 cfm for a working area of 3 x 2



ft. Outlet velocity of exhaust air is approximately 5000 cfm at outlet and 750 cfm at 20 ft from ground level.

* * *

STARTING an investigation of gating and risering for its castings Lynchburg Foundry Co., Lynchburg, Va., studied those with the lowest scrap loss, and after plotting the pouring times found that they conformed to a smooth curve with the following equation: $2.2\sqrt{W}$ = pouring time in seconds, where W is weight of the casting in pounds. It also was found that with those castings the choke was in the sprue. By changing the time of pouring and incorporating the choke on other castings which did not quite meet those requirements, it was found that scrap loss decreased. Other equations which tie in with pouring time and choke include effective sprue height, which is equal to $2HC - P^2/2C$ where H is the height of the sprue above the choke, C is the height of the casting, and P is the height of the casting above the choke. Area of the choke in square inches is equal to $0.13\sqrt{W}/\sqrt{EHS}$ where W is the weight of the casting, and EHS is the effective sprue height. Other data indicate that the choke should be from three to four times as wide as it is high.

* * *

INCREASED respect for castings is accomplished by painting, according to Guy Hubbard in a recent issue of *Steel*. His remarks follow: "The finest machine tool casting is not a thing of beauty when first shaken out of the sand. Before it is ready to machine, snagging, grinding and dressing down are necessary. Those free-hand operations—because of dirt and noise involved—never did mix well with precision work. In more and more cases, I find that this preparatory work is being done prior to shop delivery—even to the extent of spraying on sealer coats both inside and outside. While done primarily to keep undesirable operations away from the shop, this system pays big dividends in the way of reduced breakage and better workmanship. The same technicians who handle rough castings carelessly, treat filled castings with respect, both on machine and on the erecting floor. Psychological effect of a coat of paint is remarkable."

* * *

HOISTING or lifting speeds of battery-powered fork trucks are almost directly proportional to the impressed voltage for a given load, according to the Mercury Mfg. Co., Chicago 9, and higher voltages will provide faster lifting speeds. The firm cites an example of a 5000-lb truck under two voltage conditions of 30 and 36 volts. When powered by a 30-volt industrial battery the truck has average hoisting speeds of 29 fpm with empty forks and 14 fpm when loaded to capacity. When powered by a 36-volt power source, the same truck can lift its unloaded forks at a speed of 34 fpm and capacity loads at 18 fpm; this represents a hoisting speed gain of about 17 per cent. Similar possibilities exist for larger and smaller industrial trucks.

* * *

STUDY OF "Factors Affecting the Solubility of Carbon in Iron" by R. V. Riley, and reported at the annual meeting of the Institute of British Foundrymen indicates that in a large degree, the amount of ash in the carbonaceous additive material determines the absorption by the iron. As a consequence coke with its higher ash content provides a lower solubility rate than do purer graphite materials such as electrode graphite or low ash natural graphite. Coating coke with sodium carbonate to provide a flux for the ash gave marked increase in solubility rate. Size of carbonaceous materials was graded from $\frac{1}{16}$ to $\frac{1}{4}$-in. particles. Larger size required longer time of contact. A finely divided type of carbon with low ash content and large surface area as exemplified by acetylene black showed practically no increase in carbon in the iron.

* * *

INVESTIGATION of grain refinement of aluminum alloys by titanium and boron by A. Cibula, and reported in the September issue of the *Journal* of the Institute of Metals (London), shows that when boron is added to aluminum alloy melts containing titanium, marked grain refinement is produced. Two combinations of Ti and B contents have been selected from the results for practical use. One is composed of 0.01 per cent Ti plus 0.003 per cent B for alloys cast at low temperatures, and 0.03 per cent Ti plus 0.01 per cent B for alloys which have to be heated above 1328°F. Mold reaction and loss of refinement caused by remelting in alloys containing those additions are said to be slight and not likely to be of any practical importance, and grain coarsening due to gravity segregation during solidification is reduced.

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Adventures of BILL

By PAT DWYER
Illustrations by RICHEY

SINCE curiosity about other people and their affairs is one sin for which I shall *not* have to render an account when the Great Day comes, I paid no attention to the sounds of revelry coming from a house across the street one night recently while Bill and I smoked the pipe of peace on the veranda of my modest cot. I was mildly surprised when Bill suddenly asked me if I recognized the words and music of the song floating out through the open doors and windows.

I answered him as politely as the occasion seemed to demand. I told him I was not interested in the doings of unknown people across the street and therefore I had not been listening. If these people wanted to howl like so many coyotes, that was their undoubted right and privilege under the terms of the Constitution and Bill of Rights. For the benefit of the loyal reader who has followed me up to this point, let me hasten to explain all the foregoing elaborate reply was boiled down and compressed into the single word NO.

"What's the idea?" I continued. "What justification have you to offer for attempting to break up a peaceful and happy evening by adopting the role of one of these omnipotent quiz masters who brazenly offers a trembling victim a trip around the world, Yerba Buena island in San Francisco Bay with a fence around it for a goat pasture, and a pair of brass knuckles with your name outlined in rhinestones on the back. All the victim has to do is name a song and an author's name when the inquisitor's confederate behind the curtain bangs out the introductory bars of a moronic ditty that has polluted the air waves all over the country for the past month. I pause for a reply."

"If you ask my frank and undiluted opinion, it is about time. If you had paused at the beginning instead of hopping off on the wrong foot as usual, if you had cocked up the pointed ears instead of letting them droop like the early tomato leaves in an amateur's garden, you would be entitled to an A instead of the F I now have pleasure of inscribing on your report card.

"In this modern age when every person depends on juke boxes and television for all forms of musical entertainment, it is positively refreshing to see and hear a group of young people actually singing while one member joyously pounds out a rattling, lilting accompaniment on a piano. It is even more refreshing to hear that group across the street going to town in great shape on 'The Old Oaken Bucket.'

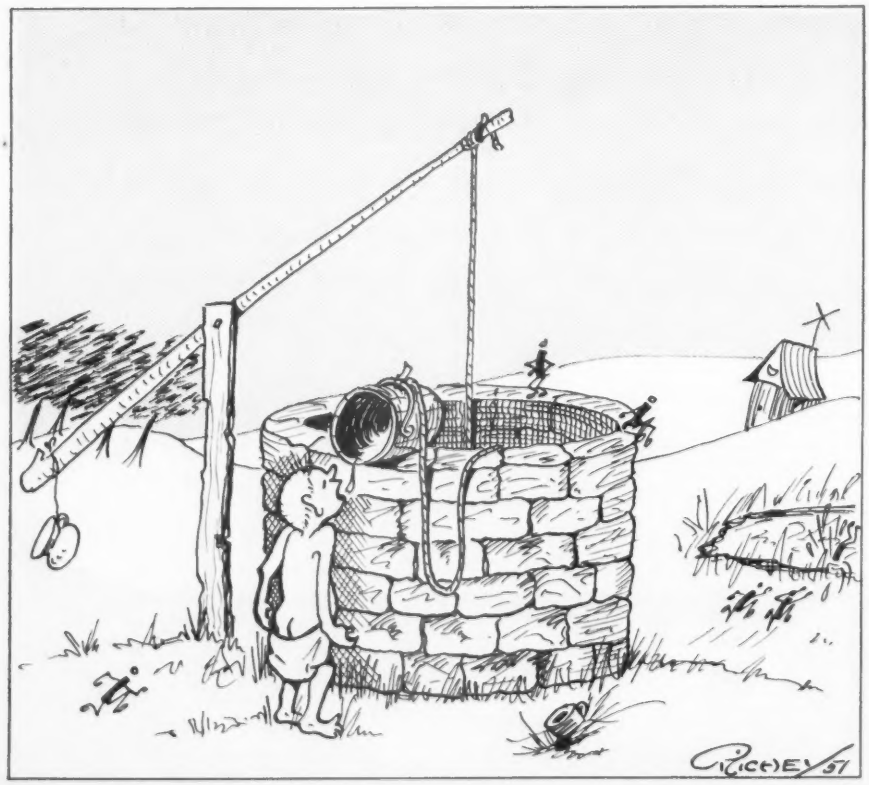
"Pon my word," he declared enthusiastically, "this performance tonight has taken me back through time and space, nearly 2000 miles of one and over half a century of the other where and when in company with congenial companions I lifted my voice in praise of the same old bucket. It was always a *must* on every hay ride and sleigh ride party a'ong with several other sterling numbers including 'Seeing Nellie Home,' 'After The Ball,' 'Annie Laurie' and 'Where Is My Wandering Boy Tonight.' Since none of us at that time owned a boy of any kind, wandering or otherwise, our interest never reached the crying stage."

"The trouble with you singers and ex-singers," I said to Bill, "is that you never read the words of a song for style or sense. Each word simply represents a note on the musical scale. In many instances a word means three or four notes when it is dragged along by the hair. I'll admit the melody is pleasing to the ear, but I for one—and, I suppose, others with delicate ears—experience a mild earache each time a singer or a group of singers convert Samuel Woodworth's Old Oaken Bucket into Thee Ol-dah Oakin Buck-it That Hung Een Tha Wehl."

"Delicate ears, sez he!" Bill flipped both hands in a gesture of utter futility. "If you take the advice of a true friend, the present speaker, you will avoid traveling in open top cars, or even in closed cars with one or more windows open, when moving at high or even moderate speed. Stand well back at the crossing when a train is passing. If you don't rig a life line from the back door to the garage you will be whisked off your feet some day by a 15-mph breeze and left hanging like a toy balloon on a telegraph wire or in the branches of a tree. Delicate ears, hey? You certainly were not behind the door or under the bed when the fairies were distributing these here now hearing aids."

"Bill," I said, "if you pull your head out of the old oaken bucket and take a good look at it you will see that the words of the song do not stand up very well under a cold impersonal appraisal. The author mentions the orchard, the meadow,

(*Continued on page* 222)



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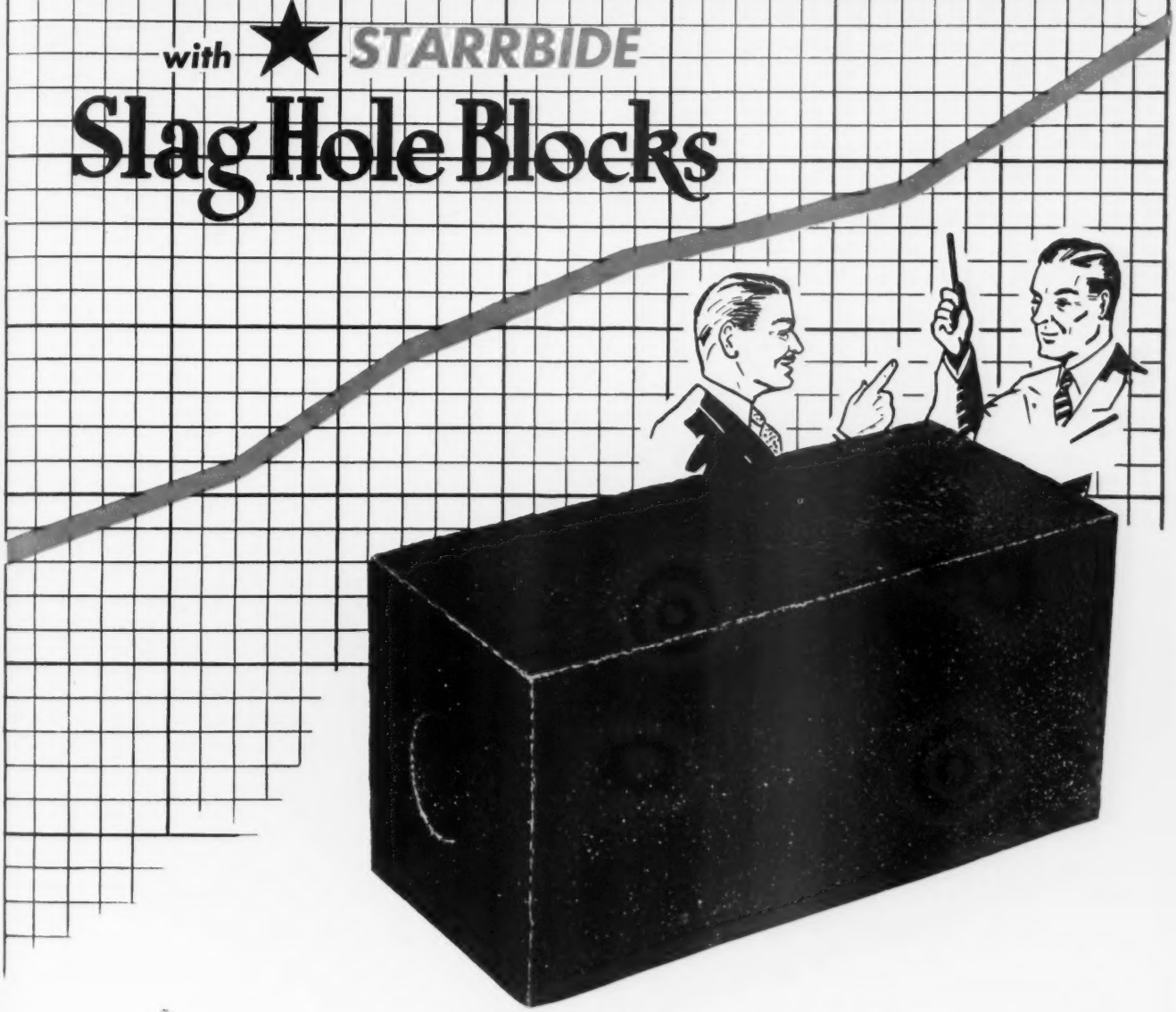

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(*Continued from page* 220)

the deep tangled wildwood and every loved spot that his infancy knew. I am willing to admit some infants are precocious, but I think Sammy is straining the bonds of friendship and credulity too far, when he asks us to believe that while still an infant he was accustomed to go prowling through the orchard, the meadow and especially the deep tangled wildwood.

"Not satisfied with this fantastic claim, he tells us he remembers the wide spreading pond and the mill that stood by it, the bridge and the rock where the cataract fell, the cot of his father, the dairy house nigh it and even the rude bucket that hung in the well. Quite an observing infant. I am rather surprised he did not claim that he wriggled out of his cradle every morning, dashed over the bridge and took a header into the wide spreading pond. Coming up for air with his eyes filled with duck weed and mud he may be pardoned for claiming that the mill stood by the side of the pond. As an infant, even a little sharpie, he hardly could be expected to note that a flume conducted the water from the pond to an overshot or undershot water wheel far below the level of the wide spreading pond.

"In the second verse the gallant young hero dips a little deeper into his bag of infancy memories. Listen: 'The moss covered bucket I hailed as a treasure, for often at noon when returned from the field, I found it the source of an exquisite pleasure, the purest and sweetest that nature can yield.' Seems to me that is a bit of double talk 'often at noon.' Why should not one trip be sufficient? If the whole truth were known he probably made half a dozen trips before noon. And finally how about a little more publicity on what an infant possibly could be doing in a field presumably a long way beyond the orchard, the meadow and the deep tangled wildwood?

"His dear teacher would not approve of converting an adverb into an adjective just to make the line scan. 'How *ardent* I seized it with hands that were glowing, and quick to the white-pebbled bottom it fell.' Quite a trick if one can get away with it. Only a full grown man with years of special training can drop one of these perverse inanimate oaken buckets far enough below the surface to partly fill it with water. What chance has an infant?

"The whole effort is a mass of contradictions. In the first verse the poet speaks of the cot of his father surrounded by a few out houses, the meadow, the orchard and the deep tangled wildwood. In the last verse we find the brazen statement 'As fancy reverts to my father's *plantation* and sighs for the bucket that hung in the well.' "

"Dear Sir and Bro.," Bill said. "Your highly esteemed favor of recent date to hand and contents carefully noted. In reply beg to advise you're as wet as the old oaken bucket. Yours faithfully and so forth.

"Now," he continued, "that you have spilled all that bitter brew out of your system I shall regale you with something in lighter vein. I had an inquiry from an estimable citizen who wrote that he would like to learn more about a certain material for making pattern mounts. He understood that it is supplied in loose bulk and is manipulated like sand. After the mount is prepared it is set to one side for several hours, when it becomes as solid and hard as cement.

"The manufacturer of this proprietary material also supplies malleable iron pattern frames ½ in.

(*Concluded on page* 224)

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This line frequency induction furnace, so universally used in the wrought brass industry, is now, because of improved linings, available for melting ferrous alloys used in the foundry industry.

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An Open Letter to the Aluminum Foundries *from the* U. S. REDUCTION CO.

WE NEED YOUR HELP!

At the time this message was prepared – early September – aluminum scrap had become extremely scarce. We hope sincerely that by now the normal flow of scrap has resumed.

You can help the aluminum smelters as well as yourselves by doing everything in your power to see that scrap gets back to them through normal channels. Talk to your friends and customers who generate scrap in their operations and urge them to return this desperately needed scrap – all types and grades – large or small quantities – to the smelters through their regular scrap dealers.

Without scrap the smelters must continue to curtail their much needed production and you will not get the aluminum alloys you need in the quantities necessary to produce the castings required in the defense effort by your customers.

WON'T YOU HELP THE ALUMINUM SMELTERS – THE DEFENSE PROGRAM – AND YOURSELF?

For 47 years, pioneers in aluminum development.

USCO

U.S. REDUCTION CO.

East Chicago, Indiana

PLANTS: EAST CHICAGO, INDIANA • TOLEDO, OHIO

(*Concluded from page 222*)

thick with pins and pin holes and countersunk screw holes. The frame has an undercut bevel that overlaps the edges of the composition and binds it firmly to the plate, or pattern board. Frame and board receive all the rapping, handling, etc., and protect the pattern from strain and abuse. It is claimed that patterns mounted in this manner last from five to ten times as long as similar patterns unmounted or simply handled as units. The system is applicable to wood or metal patterns.

"One side of the pattern first is molded in composition with parting line and runner. A transfer of this drag match is made in composition to serve as a cope match. Then the pattern is set back in the first impression and fastened rigidly with suitable screws. It is not necessary to make a preliminary sand mold. There is no sand to clean off after the matches are finished. Take, for example, a small pulley pattern. The drag frame is secured to the board by an intermediate wood frame designed to bring the iron frame in proper relation to the parting line. The pattern should rest level on end-grain, shellacked wood blocks to allow about ½-in. of composition below the lowest point of the pattern.

"The pattern is attached firmly to the pattern board by several long screws which pass through the supporting blocks and enter drilled and tapped holes in the event the pattern is metal. Small wedges are useful in locating the pattern on the blocks in a manner to insure a clean, vertical draw. After mixing a sufficient quantity, the composition material is tucked and rammed under and around the pattern until the frame is filled. The parting is made as in ordinary sand practice.

"After the parting is made, the pattern is unscrewed and removed. The small wood blocks remain in the composition. The parting is gone over carefully and slicked. The match is set away to harden for 12 to 24 hours in a dry place and at a temperature of 70 to 80° F. When the drag match is dried, the cope core print is set in loosely for transfer to the cope match. The drag match face is dusted lightly with parting compound shaken from a bag. For this purpose tumbler dust is recommended. This material does not absorb oil and stick to the face of fresh mounts.

"The cope pattern frame, the frame with the pins, is set in position on the drag mount and a wood frame of sufficient depth to match the depth of the pattern face is clamped on top. A fresh batch of compound is prepared and rammed in place. Surplus material is struck off and the frame is brushed clean. The cope pattern board is clamped in place, the assembly is turned over and the drag match is removed. The cope match then is set away to harden over night as in the previous instance. The pattern is returned to the drag match and attached permanently. It is considered advisable to apply two coats of shellac varnish to the surface of each mount. Between coats, the surface is smoothed with fine sand paper.

"Metal match plates and gated patterns readily are adapted for use on a two plate molding machine by following the same procedure. It is claimed the method produces a perfectly accurate pair of mounts without injuring or altering the match-plate or card of patterns. Pattern mounts are equally valuable for bench, floor or squeezer molding. In this instance the pattern merely is set, not fastened, into the drag match, and no cope is required. Afterward you can inhale a slug from the old oaken bucket."

THE TEST THAT PROVES IT BEST!
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29½"
48"
54"
Buckeye Silica Firestone is the best refractory for lining cupolas . . . the above test is one of many that prove it!
The diagram shows a test that was made by a large foundry to compare the refractory efficiency of Buckeye Silica Firestone with the manufactured material this foundry had used for years.
One-half of the melting zone of the cupola was lined with Buckeye Silica Firestone, the other half with the other material. Under identical conditions, the Buckeye Silica Firestone burned only to a depth of three inches while the daily patch of the other material burned completely through as well as one inch of the backing next to the shell.
Next time, line your cupola with Buckeye Silica Firestone . . . its simplicity of use, superior refractory qualities, longer life, and definite contribution to scientific cupola control have influenced foundries all over the country to adopt it as standard.
Your requirements can quickly be determined by our service department. No obligation. Write today.
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AIRCO MACHINE GAS CUTTING

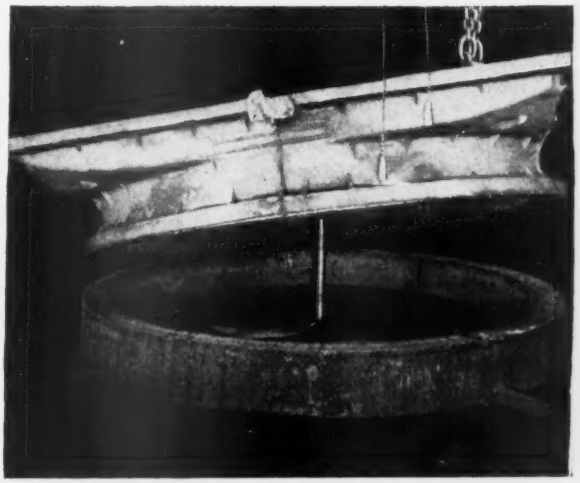
...speeds riser removal
...minimizes grinding
...increases accuracy
...reduces operator fatigue

Cutting risers with an Airco gas cutting machine saves time, greatly decreases grinding and/or machining—and by reducing operator fatigue, it increases and speeds-up production.

Here, for example, is illustrated a simple machine set-up that permits fast, accurate riser cutting. Using an Airco Radiagraph, the casting — measuring 105″ in diameter and 5″ in thickness — is trimmed at a speed of 5″ per minute. More important, the Radiagraph cuts so close to final machining specifications that slow expensive machine work or grinding is eliminated, and a costly production bottleneck is done away with.

This actual case history demonstrates the advantages of removing gates and risers by machine gas cutting. Airco gas cutting machines are easily adaptable to any cutting requirements — straight line, circle, or bevel-edge cuts.

If you would like further details on how machine gas cutting, as well as other Airco oxyacetylene processes can save time and money for your foundry operation, call or write your nearest Airco office — today.



Top photograph shows the simple set-up that makes easy work of a tough job. Above you see the clean, accurate cut, ready for machining.

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Divisions of Air Reduction Company, Incorporated
Offices in Principal Cities

Correlation of Structure And Test-Bar Properties

(*Continued from page* 125)

that, when other structural features remained substantially the same, a good correlation between size of the rounded lead particles and per cent elongation is obtained. This size effect should not be confused with the critical particle size well known in precipitation-hardening phenomena. When precipitation hardening occurs, the precipitated phase has a hardening effect at least partly by virtue of the keying action in the matrix. The lead particle in 85-5-5-5 alloy is substantially without strength and may be regarded as a discontinuity quite similar to a void.

A similar example of the effect of the size of a rounded discontinuity on elongation values is that observed in malleable cast iron. In general, it has been noted in malleable cast iron that any factor which produces an exceedingly fine graphite nodule, all other factors the same, also produces a marked reduction in elongation without altering the hardness of the casting. In other words, a large number of fine graphite nodules has a more adverse effect on elongation than a similar total volume of coarser nodular graphite. Although the effect of the size of the rounded lead particle noted here is based on the examination of a large number of specimens, this conclusion is neither readily subjected to rigid proof nor is it supported by a large number of observations of a similar phenomenon in other metals or alloys. Thus, the effect of angular lead particles noted above can be quite safely accepted, whereas the theory or explanation of the effect of the size of the rounded lead particles must be regarded as tentative.

Localized Shrinkage—Certain test-bar designs, notably the L.T.B.-2 and, to some extent, the Crown-type bars, have a tendency to be subject to localized shrinkage. Examples of this defect are illustrated by Figs. 13 and 14 in the accompanying microradiographs. In 85-5-5-5 alloy, the presence of localized shrinkage is best noted on the fracture. If such a defect has affected the tensile properties, it will necessarily cause a fracture to occur through it. When this happens, the shrinkage defect is readily visible on the fracture of the 85-5-5-5 alloy as fairly large coppery areas, because the fracture occurred through these voids rather than through the lead particles.

A lead-gray appearance produced by a fracture through the lead particles is usually indicative of a sound fracture. If the shrinkage is of the centerline type, the coppery areas will be observed to occur near the centerline of the test bar. When shrinkage occurs, it is of the centerline type when the grains are columnar; in other words, the radial grains extend from the periphery toward the interior and the shrinkage occurs at their junction near the center. On the other hand, if localized shrinkage occurs when the pouring temperature is low and the grains are equiaxed, the shrinkage cavities are more generally distributed. Examples of both the centerline and more generally distributed types of shrinkage are illustrated by the microradiographs in Figs. 13 and 14.

In general, any test bar subject to localized shrinkage is not too desirable as a means of measuring melt quality. The occurrence of the localized shrinkage is dependent upon design and relatively independent of melt quality, and, therefore, the low results produced by it may give an erroneous impression. Partly for this reason, the L.T.B., Crown-type bars,

increase production 40% plus

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INFINITELY VARIABLE SPEED
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Increases Wheel Life!
Lowers Wheel Cost!

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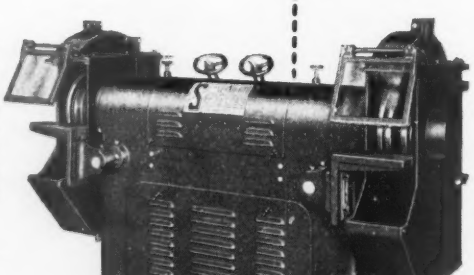

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and the British D.T.D. bar are not regarded too highly as a means of measuring melt quality in the foundry.[26]

As previously indicated, the occurrence of shrinkage is best noted on the fracture. Because this type of defect is localized, the section microradiographed may or may not pass through such a defect. Therefore, it is entirely possible to have shrinkage appear on the fracture without its being revealed on a microradiograph of a section cut adjacent to the fracture. Quite frequently, however, when shrinkage occurs on the fracture, it is also visible on the microradiograph of the section cut from a position adjacent to it.

It will a'so be noted, as illustrated by Fig. 13, that quite frequently the centerline type of localized shrinkage is accompanied by a certain amount of lead segregation. In other words, the lead tends to partially fill the centerline shrinkage cavity. It is quite probable that this is the reason that the presence of lead tends to reduce the percentage of leakers. Because localized shrinkage is not the only cause of leakers, however, it is not to be expected that lead would necessarily eliminate all difficulties with leakage in the castings. Other factors may be responsible.

Lead Particles Are Coarse

Both Fig. 12 and Fig. 13 illustrate L.T.B. test bars poured at a high temperature from a single melt of high quality. The amount of microporosity (light area) in both of these bars is relatively small, and the lead particles (black areas) are fairly coarse and rounded for this design. In Fig. 13, however, which represents a bar fed with a 3½-in. blind riser, localized centerline shrinkage occurred. The centerline type of shrinkage is associated with the columnar grain, and part of this shrinkage is filled with lead. Good tensile properties are obtained in the bar shown by Fig. 12, and, because of the shrinkage, rather poor tensile properties were obtained in the other bar (Fig. 13). The shrinkage shown on the microradiograph, Fig. 13, was also revealed on the fracture. These two figures show the general susceptibility of the L.T.B. to shrinkage induced by a relatively small change in risering practice.

The microradiograph of Fig. 14 is a typical illustration of the L.T.B.-2 test bar poured at a low temperature. Microporosity is practically absent, but some generally distributed shrinkage occurs. This localized shrinkage, more generally distributed, is associated with the equiaxed grains. When columnar grains are formed, such as those shown in Fig. 13, the shrinkage is centerline. As a result of the angular lead particles and the generally distributed shrinkage, the tensile properties of this bar are low, despite the substantial absence of microporosity.

The Fig. 15 microradiograph shows a typical L.T.B.-2 test bar poured from a melt of high quality at a high pouring temperature. The quantity of microporosity is small; the lead particles are fairly fine but rounded. The result is that good tensile properties are obtained. This and the test bars represented by Figs. 16, 17 and 18 were all poured at a high temperature from the same high-quality melt. Therefore, this microradiograph should be compared with the following three, which show the effects of test-bar design.

In the microradiograph of Fig. 16 there is slightly more microporosity than in Fig. 15, and the lead particles appear to be slightly coarser, though generally rounded. The greater quantity of microporosity quite probably accounts for the lower tensile prop-

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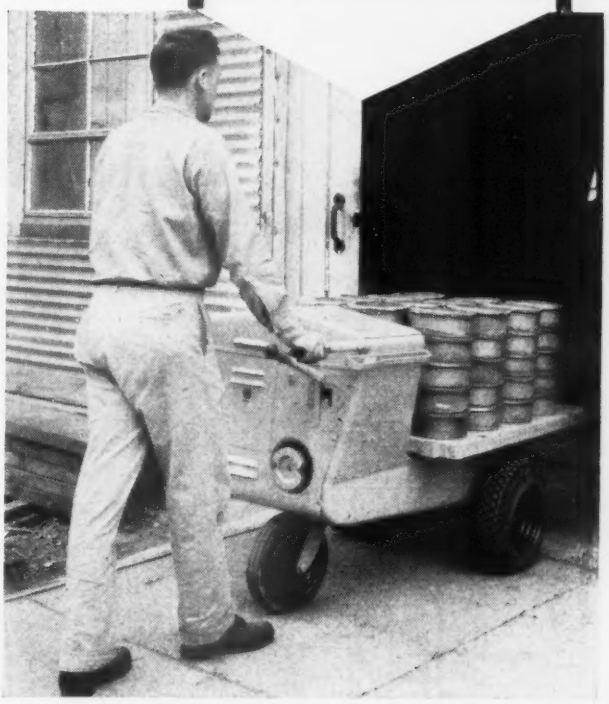

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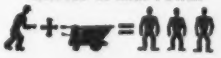

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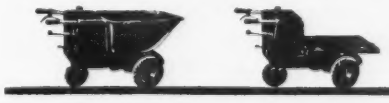

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erties than were obtained from the L.T.B. bar, shown in Fig. 15. The lead particles appear quite coarse and angular in certain areas of the sections and may account, in part, for the relatively low properties obtained in this design which, on an average, produces about 4 per cent lower elongation at this pouring temperature than either the L.T.B.-2 or the Navy 5/16-in. web-Webbert.

The microradiograph of Fig. 17 shows the lead particles to be only slightly coarse (more favorable) and the microporosity slightly more abundant than in the L.T.B. bar poured from the same melt and illustrated by Fig. 15. This similarity of lead distribution, but slightly greater amount of microporosity, is to be expected in view of the similar lead factor and slightly greater porosity factor previously described. The tensile properties of the two bars are, therefore, quite similar.

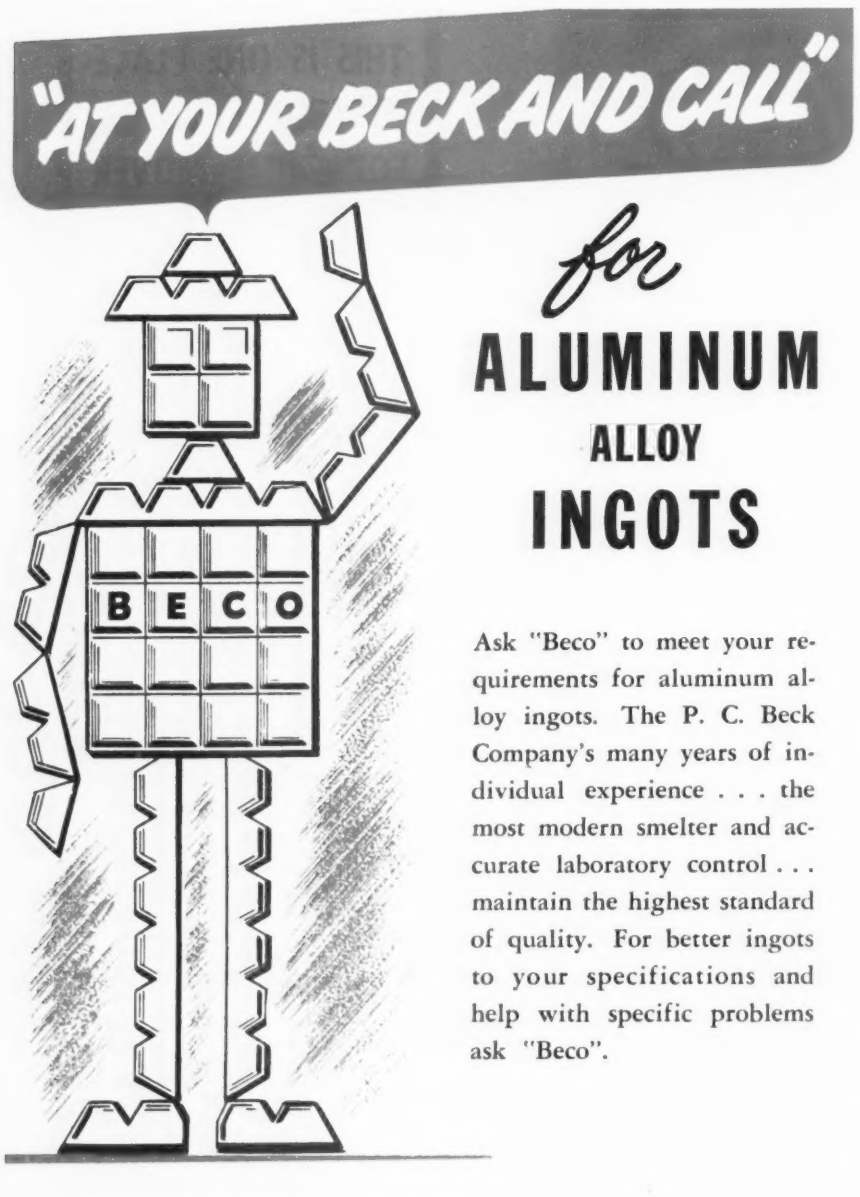
Fig. 18, compared with the preceding three, shows that the lead particles are slightly coarser, but this more favorable structure is offset by the slightly coarser microporosity present. The net result is that a slightly lower elongation was obtained in this instance. This is a typical microstructure obtained at this pouring temperature for this design. It will be noted that the heaviest microporosity occurs adjacent to the web.

Estimated Effects of Lead Particle Size and Shape, Microporosity, and Localized Shrinkage—An analysis of the structure has indicated that the mechanical properties of 85-5-5-5 alloy test bars are largely dependent upon the size and shape of the lead particles, microporosity, and internal shrinkage. The separate effects of each of these factors have been estimated for five different test-bar designs. Their specific effects are referred to as the porosity factor, lead factor and shrinkage factor.

Lead Factor—Because the lead particle size apparently is the most favorable in the Modified 5/8-in. web-Webbert poured at a temperature of about 2250° F, the lead factor for this condition was taken as zero. It is quite likely that the lead for this favorable distribution has little or no effect upon the elongation. Any other less favorable lead distribution has been estimated in terms of the decrease in elongation value produced by it. These estimates are illustrated by Fig. 5. It will be noted that the lead factor of the Modified 5/8-in. web-Webbert is zero at the high pouring temperature, and this factor gradually becomes more adverse as the pouring temperature is decreased to 2150° F and then decreases quite rapidly to −15 per cent at a pouring temperature of 2025° F.

The Horizontal 5/8-in. web-Webbert has a finer lead particle size at the high pouring temperature than the Modified 5/8-in. web-Webbert. Therefore, the lead factor at a pouring temperature of 2225° F is estimated to be −7.5 per cent. Again, this lead factor becomes slightly more adverse as the pouring temperature is decreased to 2150° F, and then more decidedly adverse as the pouring temperature is decreased to 2025° F.

Likewise, the L.T.B.-2, Navy 5/8-in. web-Crown, and the Navy 7/8-in. web-Webbert, all of which have a similar fine lead particle size, are estimated to have a lead factor of −1[illegible] per cent at the high pouring temperatures. Because all designs have similar angular lead particles at a pouring temperature near 2000° F, the lead-factor curves all converge to approximately the same point at this temperature. Of these five designs only the L.T.B.-2 and the Crown-type bars are subject to localized shrinkage, and then only at the lower pouring temperatures. Therefore, Fig. [illegible]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also shows the lead plus localized shrinkage factor for the L.T.B-2 and Crown-type bars.

Porosity Factor—Because the test-bar properties apparently are determined largely by the lead plus shrinkage and the porosity factors, the latter can be readily calculated if the lead plus shrinkage factor has been estimated as decribed above. A considerable amount of data on the Horizontal 5/8-in. web-Webbert test bar indicates that, when test bars are poured at a high temperature to produce rounded lead particles, but with little or no microporosity, an elongation value of about 52 per cent is obtained. Because this design at the high pouring temperature has a lead factor of −7.5 per cent, then the Modified 5/8-in. web-Webbert, if completely sound, should produce about 52 plus 7.5 or 59.5 per cent elongation, and the L.T.B.-2, Navy 5/8-in. web-Webbert, and Navy 5/8-in. web-Crown should produce, if completely sound, about 59.5 minus 15 or 44.5 per cent elongation if they were poured at about 2225° F. Because the lead particles in Modified 5/8-in. web-Webbert probably have no adverse effect on elongation, it also follows that a sound lead-free alloy otherwise similar to 85-5-5-5 alloy would also produce about 60 per cent elongation. The data (Fig. 10) discussed a little later in this article will show this to be correct.

The actual average per cent elongations obtained on these various designs have been determined for good-quality melts and for poor-quality melts, as described in a previous article.[5] The porosity factor for each test-bar design and for each melt quality can then be calculated from the actual elongation value and the estimated lead factor. This has been done and the results are illustrated in Fig. 7. This figure shows that the porosity factor is, of course, the greatest for a given set of conditions when a melt of a low quality or high gas content is used. In general, the cast-to-shape designs which solidify the most rapidly have the lowest porosity factor. The Modified 5/8-in. web-Webbert appears the least sensitive to pouring temperature, at least with good-quality melts, but the horizontal 5/8-in. web-Webbert appears to undergo the greatest numerical change in porosity factor. For example, if a poor-quality melt is poured into this test-bar mold at 2225° F and another similar mold is poured from a high-quality melt from 2025° F, the porosity factor, expressed in elongation, changes from −43 per cent to −4 per cent.

The effects of temperature on the average density of the test bars made of the different designs are illustrated by Fig. 8. In general, they correlate fairly well with the estimated porosity factors. It should be emphasized, of course, that the effect of the voids in the test bar depends not only upon their total volume measured by density, but also upon the size and shape of the voids. A perfect correlation between the porosity factor and the average per cent voids in the test bars cannot, therefore, be expected.

After the above estimates, based on metallographic and microradiographic examinations, had been made, several additional heats were poured to precisely evaluate the porosity and lead factors for the Horizontal 5/8-in. web-Webbert test bar. (This bar is similar to ASTM B-208-49T, Fig. 6.) Test bars with practically 0 per cent porosity were produced by casting them in a warm calcined-clay mold previously baked at 1600° F. The lead factor was evaluated by preparing a lead-free alloy with copper, tin, zinc, and normal impurities in the same ratio as in the 85-5-5-5 alloy. The actual tensile properties and the estimated tensile properties based on the lead and porosity factors are illustrated by Figs. 9, 10 and 11. Con-

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sidering that the lead and porosity factors were estimated prior to the attainment of these data, the agreement is remarkably satisfactory.

Summary—The structural features, other than the copper-tin-zinc matrix, which mainly appear to determine the tensile properties of 85-5-5-5 alloy are (1) quantity, shape and size of the voids constituting microporosity, (2) the size and shape of the lead particles, and (3) the occurence of localized shrinkage. The greater the amount of microporosity and the coarser it is, the more adverse the effect on both tensile strength and elongation. The amount of microporosity decreases with (1) a decrease in the gas content of the melt, (2) a decrease in pouring temperature, and (3) an increase in the solidification rate of the test section of the bar. Consequently, these factors tend to increase the tensile strength and elongation values.

Apparently, coarse, rounded lead particles are the most favorable to the production of high elongation values, and as the rounded lead particle size decreases, the lead probably becomes less favorable in distribution. The Modified ⅝-inch web-Web bert bar has the optimum lead distribution because substantially mor rapid solidification rates produc finer, less favorable lead particles whereas markedly less rap.d solidi fication rates, as in the keel block produce much less favorable coarse angular lead particles. At low pouring temperatures, all test-bar designs tend to produce equiaxed grains, accompanied by relatively coarse, angular lead particles which, in conformity with established metallurgical principles, have adverse effects on the elongation values, but a less adverse effect on tensile strength.

Localized shrinkage sometimes occurs in certain designs, especially the L.T.B. and Crown-type which are cast to size. If the localized shrinkage occurs when the pouring temperature is relatively high and columnar grains are formed, a centerline type of shrinkage occurs. When however, the localized shrinkage occurs at low pouring temperatures, accompanied by equiaxed grains, the shrinkage porosity is more generally distributed throughout the test section, but is readily distinguishable from the microporosity. Either type of shrinkage causes low tensile properties. The occurence of this shrinkage is not a result of poor melt quality, but of too low a pouring temperature for this type of test bars.

It is apparent from the above that a marked reduction in the pouring temperature of the test bar reduces the amount of microporosity, but has an adverse effect upon the lead distribution or on localized shrinkage or both. Therefore, the highest elongation values are obtained normally at the intermediate pouring temperature because, as the pouring temperature is decreased from approximately 2225 to 2125° F, a substantial reduction in microporosity occurs, but with the production of only a slightly less adverse lead distribution.

However, when the pouring temperature is decreased from 2125 to 2025° F, the beneficial effects obtained by the decreased amount of microporosity are generally more than offset by the coarse, angular lead particles which are produced. Furthermore, in the cast-to-shape design, such as the L.T.B. this adverse effect is further accentuated by the occurrence of localized shrinkage. In general, a good correlation is found between the microradiograph and the test-bar properties obtained.

References

26. Kura, J. G., and L. W. Eastwood: "Correlation and Structure and Properties of 85-5-5-5 Alloy Test Bars." Presented to AFS Convention, Detroit, April, 1947. (Also see references attached to first article of this series.)

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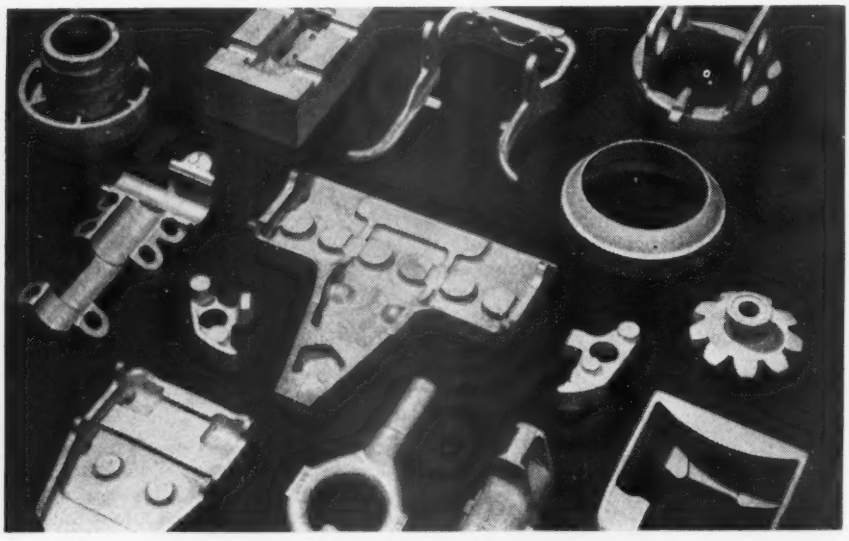

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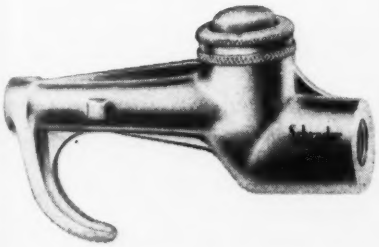

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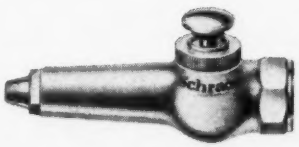

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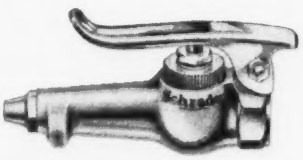

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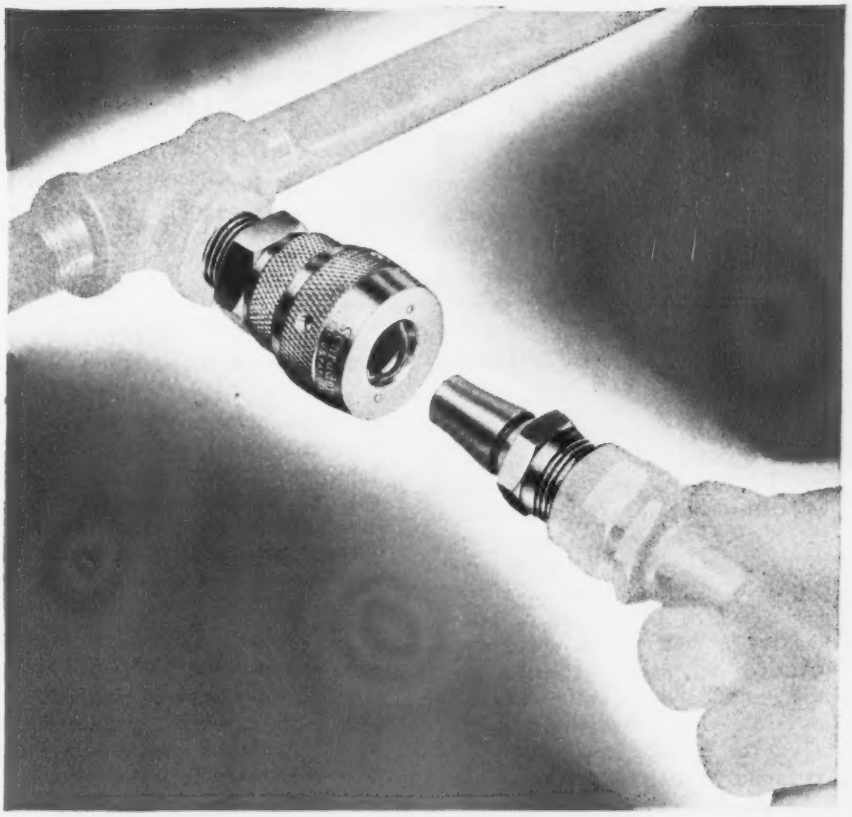

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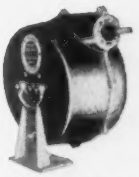

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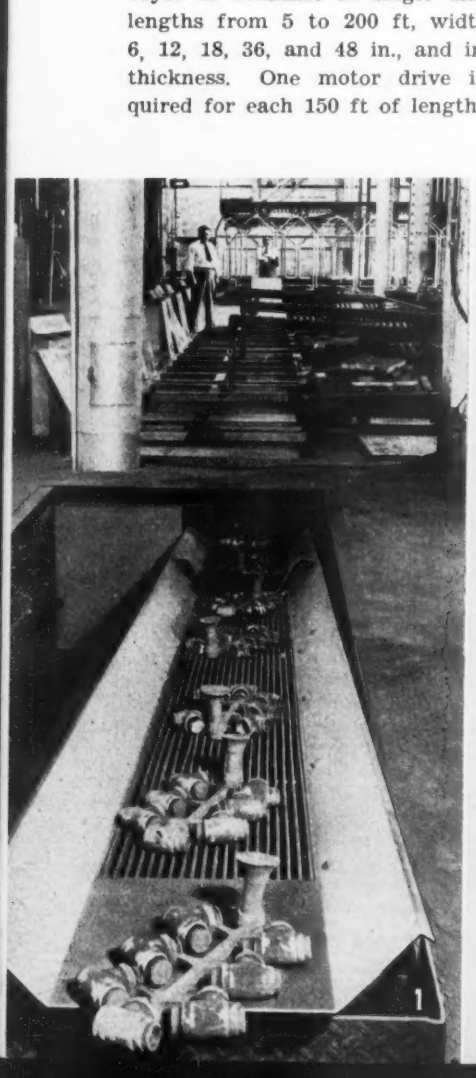
For More Details Circle No. 1—Page 235

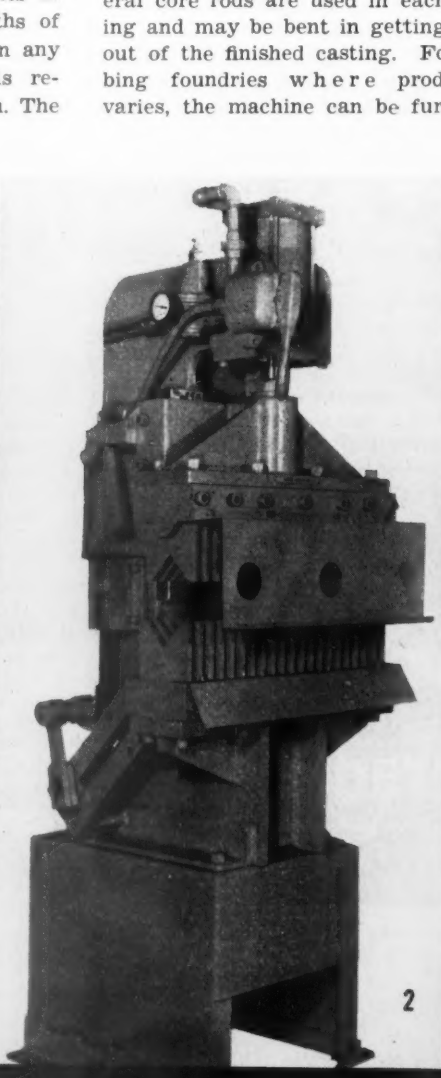
(2)—Core Rod Straightener: General Riveters Inc., 785 Hertel Ave., Buffalo 7—Air-operated core rod straightening machine is equipped with an automatic ejector or unloading device. Capacity of the machine is from ¼-in. to ½-in. core rods. The straightening V-block die surface is 24 in. right to left. The straightener was designed especially for production foundries where several core rods are used in each casting and may be bent in getting them out of the finished casting. For jobbing foundries where production varies, the machine can be furnished without the automatic unloading device, and with shorter dies, loading and unloading being done by hand.

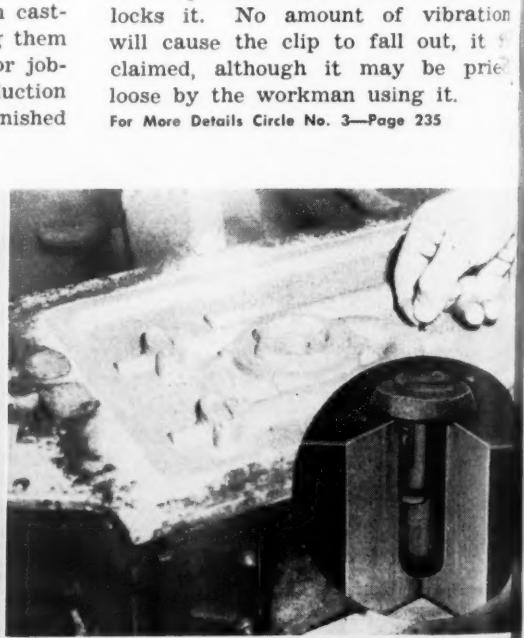
For More Details Circle No. 2—Page 235

(3)—Molders' Numbers: Tinnerman Products Inc., Box 6688, Dept. 14, Cleveland 1—Molders' numbers are held securely in matchplates by a tubular clip inserted into a ho drilled into the matchplate. Cli made with cam-like prongs wh compress when it is inserted. Inside the hole the clip exerts outward pressure to make a secure attachment. Clip is ¼-in. long and takes a ⅛-in. stud. It goes into a 0.161-in. hole. When the number plate is inserted, the clip bites the round stud and locks it. No amount of vibration will cause the clip to fall out, it claimed, although it may be pri loose by the workman using it.

For More Details Circle No. 3—Page 235







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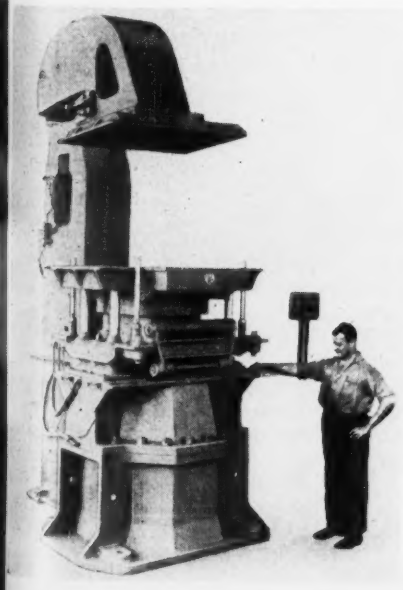
For More Details Circle No. 4—Page 235

Lenses: Pennsylvania Optical Co., 234 South Eighth St., Reading, Pa.—Safety lenses for replacement purposes comprise a companion line to the company's welding lenses. New line includes clear and absorptive lenses in flat, 1.25 and 6.00 diopter curve lenses. Each type is available in 50 mm round, 46 mm dropeye, and 44 mm dropeye sizes.

For More Details Circle No. 5—Page 235

Molding Machine: SPO Inc., 6448 Grand Division Ave., Cleveland 25—Giant jolt-squeeze-strip molding machine, said to be the world's largest of its type, features push-button control of all operations. Operating at standard 80 psi air line pressure, the machine has a squeeze capacity of 80,000 lb and jolt capacity of 4000 lb. Squeeze cylinder diameter is 36 in., pattern draw 14 in., and squeeze piston stroke 14 in. Flask space ranges from 38 in. minimum to 54 in. maximum, left to right, and from 32 to 50 in., front to back. Squeeze head is power operated, the jolt cycle timer controlled, and the squeeze cycle regulated by a pressure switch. The two-speed vibrating and stripping operations are automatically controlled. To assure accuracy, two hardened and ground bushings in each stripping yoke operate over two ground and hard-chrome plated guide pins, and the stripping mechanism is separate from the jolt unit. Machine is designed for recessing 50 in. below floor level and extends 116 in. above. All servicing can be accomplished at or above floor level.



For More Details Circle No. 6—Page 235

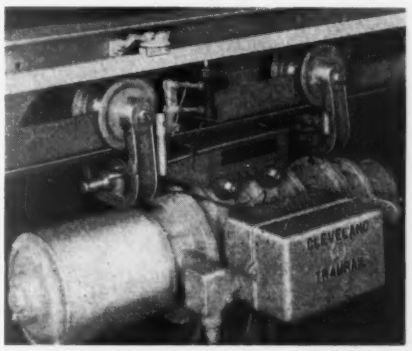
Welding Rod: Eutectic Welding Alloys Corp., Dept. TIS, 172nd St. and Northern Blvd., Flushing, N. Y.—Bronze welding rod, featuring an extra-thin initial tinning action is said to eliminate prewelding preparations and to flow where directed without extensive chamfering, even on butt joints where necessary. Tensile strength of the weld is listed at up to 55,000 psi and a 75-120 brinell.

For More Details Circle No. 7—Page 235

Lift Truck: Ginsberg Machine Co., 224 Fifth Ave., New York 1—Light, maneuverable lift truck is designed to raise or lower loads of ½-ton up to 5 ft in less than a minute. Units are equipped with either hydraulic power pump or hand pump or both. A ¾-hp electric motor is required to operate the hydraulic pump. Specifications are: Length, 4 ft 3 in., width, 2 ft 6 in.; platform, 2 ft 6 in. square; lifting range, 7 in. min, 4 ft 8 in. max.

For More Details Circle No. 8—Page 235

Electric Tramrail: Cleveland Tramrail Division, Cleveland Crane & Engineering Co., Wickliffe, O.—New type of electrification for overhead cranes and tram rail systems consists of inverted U-shaped conductor bars inside of which operate sliding current collector shoes made of graphite. This electrification arrangement may be applied to the manufacturer's new systems, as well as replacement on open bar electrification. It also may be installed on many hand-propelled systems where motor-powered hoists, carriers or cranes now are desirable. Shocks and more serious injuries from contact with power bars are prevented because the bar is enclosed with an insulating plastic covering. Sliding current collector shoes contact three sides of the bar and operate on a pantographic principle. A diagonal spring provides upward pressure on the graphitar shoe while a torsion spring within a plastic housing causes pressure to be applied on both sides of the conductor bar.

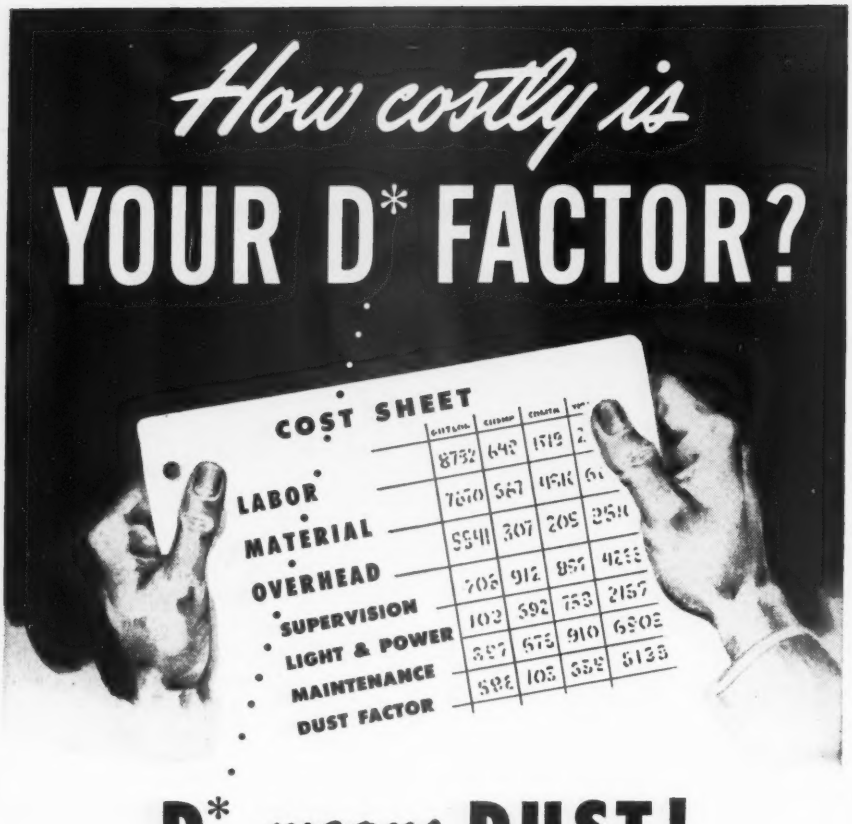


For More Details Circle No. 9—Page 235

Trolley Hoist: Wright Hoist Division, American Chain & Cable Co., 1100 East Princess St., York, Pa.—Army type trolley hoist is made in capacities from ½ to 3 tons and is available with a special load bar and either a pair of two-wheel plain trolleys or one plain and one geared two-wheel trolley. The plain trolley assembly has chilled tread wheels equipped with ball bearings, steel side plate and connections to load bar. It is adjustable for a wide range of beam sizes, and can be changed from plain to geared or vice versa in a few minutes as both the plain and geared mountings are identical. Geared trolley wheels are furnished with gear rings having cut teeth, pinions with cut teeth handwheel, hand chain and hand chain guide. Thrust rollers are mounted to insure proper alignment of the assembly whether on straight or curved track. Army type trolley hoist is designed for service where a close headroom assembly is required.

For More Details Circle No. 10—Page 235

Fire Extinguisher: Ansul Chemical Co., Marinette, Wis.—Dry chemical fire extinguisher with a rubber hose is said to offer ease of operation, flexibility in fighting overhead and ground level fires, and maximum extinguishing effectiveness for inexperienced operators. Dry chemical is ejected through a self-closing nozzle which produces a fan-shaped stream pattern. The self-closing nozzle also makes the new unit weather-tight. Extinguisher has a capacity of 4 lb of dry chemical, operating range of



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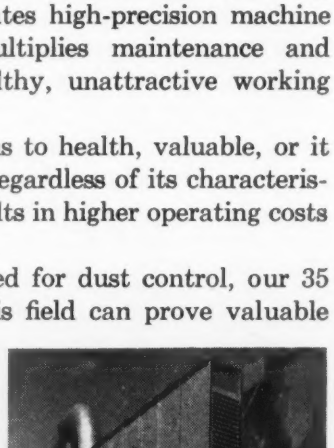

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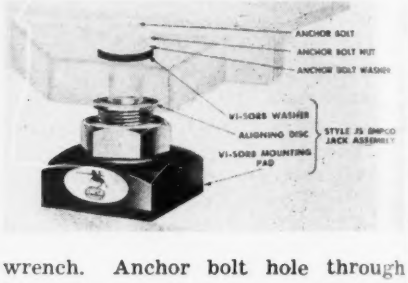
12-15 ft, and is pressurized by 1½-oz carbon dioxide cylinder in the dry chemical chamber.

For More Details Circle No. 11—Page 235

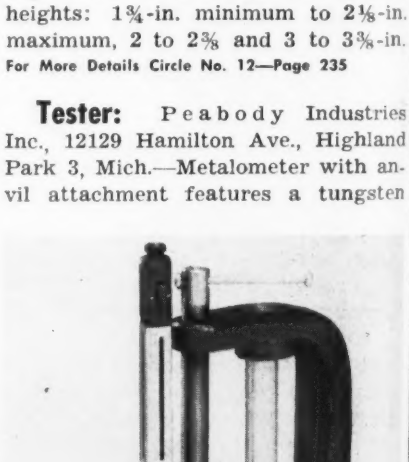
Leveling Jack: Enterprise Machine Parts Corp., 2731 Jerome Ave., Detroit 12—Leveling jack is designed to support 20 tons and lift 8000 lb without overexertion on the



wrench. Anchor bolt hole through the jack assembly allows clearance for ¾-in. diam bolt. To compensate for uneven floors, the top of lift screw has a concave spherical radius into which glides the convex spherical radius on the bottom face of the aligning disk. This permits sufficient float for the level alignment of machine while insuring maximum bearing. Jacks have ⅜-in. leveling adjustment and come in three heights: 1¾-in. minimum to 2⅛-in. maximum, 2 to 2⅜ and 3 to 3⅜-in.

For More Details Circle No. 12—Page 235

Tester: Peabody Industries Inc., 12129 Hamilton Ave., Highland Park 3, Mich.—Metalometer with anvil attachment features a tungsten



point, fine interior finishes, and trigger release mechanism. This instrument is suitable for testing the surface hardness of small parts.

For More Details Circle No. 13—Page 235

Core Binder: General Electric Co., Chemical Division, Pittsfield, Mass.—Liquid phenolic core binder

(*Continued on page* 238).

IDEAS for FOUNDRYMEN

AVAILABLE FOR THE ASKING—This reader-service is designed to provide foundrymen with "idea" and reference material. Listings are selected from company product literature and reprints of special FOUNDRY editorial articles.

50. Refractory Products

Illinois Clay Products Co.—Company's Goose Lake refractories are completely described in 4-page illustrated folder. Information on fire clay brick and flour, ground and screened fire clay and silica mix for cupola patching, as well as on their Grundite Bond Clay is included. Send for your copy!

51. Casting Grip with "Grip"

Joy Manufacturing Co. — You'll "enJoy" reading about Joy's mechanical grip for holding irregularly shaped, awkward and medium sized castings, in bulletin 76-M. Device grips these castings with air powered jaws for cleaning and snagging operations. Bulletin shows applications and gives specifications.

52. Build Your Own Racks

Unistrut Products Co. — Without special tools or equipment and without skilled help you can build your own racks for pallets and skids, general storage, wire, display, parts, etc. How? By using Unistrut all-purpose metal framing, described in catalog 600, which allows assembly, alteration and moving of racks all parts of which are adjustable and reusable.

53. Hydraulic Lift Has 'Oomph'

H. & S. Mfg. Co.—Illustrated folder describes and shows application of Port-A-Lift hydraulic lift designed to heft 100 to 500 lb loads. Used in die shops, motor repair shops, packing houses etc., lift is fast, efficient and durable.

54. Flawless Castings

"Radium Radiography" is the title of a 48-page practical treatise which explains the use of this method for nondestructive testing of metal castings and parts. Prepared by two recognized experts, this well-illustrated booklet tells the exact procedures to employ and shows how to locate flaws and defects.

55. Brakemotors & Generators

Star-Kimble Electric Co. — Two good illustrated bulletins present general information and outstanding features of Star alternating and direct current brakemotors and S-K direct current motors and generators. Former bulletin, No. B-501-A, covers series or shunt wound, ½ to 100-hp brakemotors in frame sizes 151 to 505. No. B1001 covers ball bearing units rated at ½ to 200 hp, 1 to 150 kw.

56. Cranes, Cranes, Cranes

Thew Shovel Co. — That's what you'll see pictured in 18-page booklet entitled "Lorains in Industry" simply because these muscle machines have such wide application in handling any type, size or shape material. Pictured and described are Lorain cranes handling lumber, plant components, bulk materials, metal scrap and most anything you can think of. Get this interesting booklet.

57. Air Tools

Rotor Tool Co.—Bulletin No. 38 entitled "Air Tools for the Foundry, Steel Mill, Production Line, Assembly Plant" packs in its 43 illustrated pages all the info you'll want to know on company's line of air-operated screw drivers, nut setters, sanders, drills, grinders, rammers, chippers, scalers and what have you. It's punched for binder insertion, and yours for the asking.

58. A Pallet for Every Job

L & H Wood Mfg. Co.—Single information sheet illustrates hardwood pallets made to your specification for easy stacking, unit loading, tray packing or as special containers. Simplified set-up and knockdown features are shown. Pallets are returnable, reusable and reasonably priced.

59. Holes In Your Floors?

Monroe Co. — Just 60 seconds after Swift-Floor resurfacer has been applied to cracked, rutted or worn industrial floors, loads weighing up to 50,000 lb can be rolled over the new smooth wear-resistant surface. How to do it is explained in 4-page bulletin 62-8.

60. Lift Trucks, Hoists, Racks

Lewis-Shepard Products, Inc.—For your file there are available 13 bulletins and circulars describing company's line of materials handling equipment, all encased in heavy paper jacket. Literature covers fork and hand lift trucks, floor trucks, stackers and portable cranes, skid platforms, storage racks, and combined lifters and stackers. Sound good?

Additional Information?

For additional information on any of the items described under "New Equipment and Supplies," "Trade Publications" or "Helpful Literature" in this issue—simply circle corresponding item numbers on one of these cards

10-51

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61. Industrial Equipment

Newcomb-Detroit Co. — Thumbnail descriptions of standard units and engineered systems for paint finishing, dust collecting, materials handling and air handling are contained in 4 - page illustrated bulletin 1j-N. Data are given on such equipment as shake-out booths, down-draft benches, indirect heaters, ventilators, oven heaters, metal parts washers, drying ovens, dust collecting systems, fans and blowers.

62. Vacuum Cleaners

Spencer Turbine Co.—8-page illustrated bulletin 125-D describes sizes and types of industrial vacuum cleaners for conveying, collecting, reclaiming, sanitation, water pick-up and 100 other uses. Portable and stationary models are available. Clean up with this one.

63. Chisels & Blanks

Arrow Tools Inc. — Chiseling is a fine art if you have the right tools. And the right tools are found in 4-page illustrated bulletin "Pneumatic Tools for Chipping Hammers" which describes blanks and chisels in any desired shape, size or style.

64. Lifting Magnets

Dings Magnetic Separator Co. — If you have a problem involving handling of slabs, skull cracker balls, pig iron, heavy melting scrap and similar ferrous materials, you'd better get a copy of 6-page illustrated catalog No. B-1401-A. It shows construction and suggests uses of various sizes of welded lifting magnets.

65. Ovens & More Ovens

Drying Systems, Inc.—Whether its an electric, gas, oil or steam type drying or baking oven you need, you'll find just the right model in 12-page illustrated bulletin D-1. It's yours for the asking.

66. What A Dump Truck!

Wellington Machine Co.—This one dumps automatically when handles are elevated until hopper nose touches floor. Illustrated data sheet gives description and specifications, and states that truck is ideal for handling bulk materials easily when loads are too great for conventional hopper barrow. Send for it!

67. Salvage Castings Rejects

Tincher Products Co.—"The Tincher Process for Recovery of Rejects Due to Porosity in Castings and Parts" sounds formidable, doesn't it? It isn't though. It's the title of a very practical and easily-read 20-page illustrated "question and answer" booklet on a method and equipment which restores rejected castings to usable condition.

68. Plastic Mold Binders

Union Carbide & Carbon Corp., Bakelite Corp. — "The Croning Process for Making Foundry Molds and Cores" is subject of 16-page illustrated manual on method which employs powdered heat-reactive phenolic resin binders for foundry sand. Mold making techniques is shown step-by-step, and each operation is explained. This is one of the latest improvements in mold making.

69. Refractory Data

Refractory & Insulation Corp. — 40-page illustrated catalog "Refractories and Insulations" should be of interest to all of you who use refractory and insulating materials of various types in heat processing and generating equipment. It gives where, when and how information on extensive product line.

70. Conveyors & Controls

Teleflex, Inc.—Endless screw running in channel, either suspended or on bench, could be answer to your requirements for economical, efficient, lightweight light-load conveyor. It is described in neat 4-page illustrated booklet. Another catalog, No. 300, gives info on Teleflex aircraft, automotive, industrial and marine remote controls.

IMPORTANT READING FOR FOUNDRYMEN
We have a limited quantity of the following reprints which we can furnish while they last.

71. Metal Pouring Handling

Materials handling equipment used in metal pouring is discussed in this article. With molten metal a "perishable" product, proper handling between furnace and mold is a prime consideration. Maybe this reprint, "Handling Materials in Metal Pouring," can help you. At least it should be in your files.

72. Jobbing Foundry Laboratory

Organization and functions of metallurgical laboratory in a nonferrous jobbing foundry is described, along with various benefits accruing to foundry and customers from improved metallurgical practices. "The Metallurgical Laboratory in a Nonferrous Jobbing Foundry" is written by the chief metallurgist of an up-state New York foundry — really first-hand knowledge is presented.

73. Gray & Nodular Iron

Tables, graphs and photomicrographs supplement this article "Comparative Growth of Gray Iron vs Nodular Iron When Cyclically Heated to 1650° F." This should be added to your reference file—it's basic information.

74. Plastic Bonded Shell Molds

Several sets of excellent step-by-step photographs illustrate procedure in article on "Plastic Bonded Shell Molds." Authors report on applicability of heat polymerized plastics as molding sand binders for casting nonferrous or ferrous metals.

75. Farm Implement Castings

This reprint of an article by Pat Dwyer outlines the methods and procedures used in making farm implement castings in the mechanized foundry of National Farm Machinery Cooperative Inc. Perhaps you can get some good ideas from the setup in this modern plant.

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9	21	33	45	57	69	81	93	105	117
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(*Continued from page* 234)

resin is said to produce strong sand cores with good collapsibility, minimum burn in, low gas formation, and high gas permeability. The resin also can be used as a spray when diluted with four parts of water to increase the hardness of oil or resin bonded cores. The spray penetrates cores to a depth of about ⅛-in. and the hard shell which results resists penetration of metal and also protects the cores from breakage in handling.

For More Details Circle No. 14—Page 235

Pyrometer: Claud S. Gordon Co., Dept. 20, 3000 South Wallace St., Chicago 20—General purpose, portable pyrometer is designed for rapid temperature determination below 800°F. It is of the high internal resistance type for accuracy. A choice of four calibrations allows the most

effective use of the scale range. Available for use with the instrument are two needle thermocouples, a ribbon thermocouple, a surface tip thermocouple, and other specially designed thermocouples and extension arms. These are interchangeable and may be used without adjustment or recalibration of the instrument.

For More Details Circle No. 15—Page 235

Saw Guide: Paddock Tool Co., 1418 Walnut St. Kansas City, Mo.—New band-saw guide is designed to hold the blade at any angle. The three ball bearing wheels in each guide are said to reduce danger of saw blade breakage; they hold the working portion of the blade so that more work can be performed. When 36-in. band-saw machines are equipped with the guide and the blade held at an angle of 45 degrees, material can be cut to any length.

For More Details Circle No. 16—Page 235

Reproduction Paper: Eastman Kodak Co., Rochester 4 N. Y.—Tough, translucent, emulsion-coated drawing reproduction paper is designed to withstand longer and

(*Continued on page* 240)

Advertisement

ELECTROMET Data Sheet

A Digest of the Production, Properties, and Uses of Steels and Other Metals

Published by Electro Metallurgical Company, a Division of Union Carbide and Carbon Corporation, 30 East 42nd Street, New York 17, N. Y. • In Canada: Electro Metallurgical Company of Canada, Limited, Welland, Ontario

New Foundry Alloy Neutralizes Effect Of Varying Section in Gray Cast Iron

Low-Carbon Foundry Ferrochrome is a new silicon-chromium alloy specially developed by ELECTROMET for the alloying of cast iron. It is so balanced in composition that it increases the strength and Brinell hardness of gray iron, as well as its resistance to wear and corrosion, without increasing the chilling tendency of the metal.

The alloy has a nominal analysis of 50 per cent chromium and 30 per cent silicon. It has excellent solubility in iron, and the inoculating effect of the silicon content makes it possible to add up to 1 per cent chromium to gray iron as a ladle addition, with no appreciable increase in chill depth. Light-section castings, such as automobile and truck exhaust manifolds and stove parts, may easily be produced in 1 per cent chromium iron by a simple ladle addition of the alloy to any base iron that would be suitable for casting the same parts in unalloyed iron.

Effect on Chill Depth

Fig. 1 illustrates how chill depth was affected by varying additions of the new alloy to a commercial cupola iron analyzing 3.24 per cent carbon and 2.12 per cent silicon, with 0.12 per cent residual chromium. A chill depth of approximately ¼ of an inch was obtained in all of these typical hatchet-type chill-test specimens.

Effect on Mechanical Properties

Although Low-Carbon Foundry Ferrochrome was especially developed for decreasing the section sensitivity of gray iron castings, it is also useful in obtaining moderate increases in the strength of gray iron, when used alone or in combination with the alloys nickel, molybdenum, or vanadium. An unalloyed base iron, analyzing 3.43 per cent carbon and 1.95 per cent silicon, was treated with additions of 0.36 per cent and 0.84 per cent chromium. The following table gives the complete analyses of the irons. It shows how both Brinell hardness and tensile strength were improved by the alloying additions.

Analyses	Brinell Hardness	Tensile Strength
3.43 % total carbon, 1.95% Si, 0.05% Cr.....	202	31,000
3.41% total carbon, 2.20% Si, 0.36% Cr.....	217	35,400
3.32% total carbon, 2.56% Si, 0.84% Cr.....	228	36,100

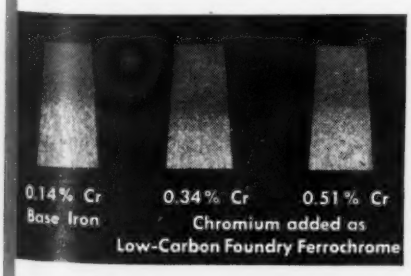

Fig. 1. These fractures of broken chill specimens show the effect on chill of chromium additions made with Low-Carbon Foundry Ferrochrome.

Auto Cylinder Castings

Addition of chromium to cast iron in the form of Low-Carbon Foundry Ferrochrome tends to stabilize the pearlitic structure of the iron, and to eliminate areas of soft secondary ferrite in slowly cooled sections. Moreover, the alloy helps avoid difficulties with chilled corners or edges in thin sections. It is therefore particularly well suited for producing a cylinder-type iron with consistently good structure and improved uniformity of hardness in sections exposed to widely varying cooling rates.

An example of the usefulness of this alloy is illustrated in Fig. 2, which shows strips cut from the bores of three automotive cylinder blocks. The base iron used in these castings was a typical unalloyed cylinder grade of cast iron, analyzing 3.38 per cent total carbon, 2.07 per cent silicon, and 0.08 per cent residual chromium.

The design of these castings was such that a heavy boss close to the cylinder bore caused slow cooling along one side, resulting in a soft area and wide variation in hardness along the length and around the perimeter of the unalloyed cylinder.

The strips illustrated in Fig. 2 were cut from the soft side of the cylinder bore. When subjected to a Rockwell B hardness exploration, casting No. 1 showed a variation in hardness from 92.2 to 80.2 Rockwell B (196 to 150 Brinell*). Casting No. 2 showed a variation from 94.0 to 90.8 Rockwell B (205 to 189 Brinell). Casting No. 3 showed a variation from 95.5 to 90.3 Rockwell B (213 to 187 Brinell).

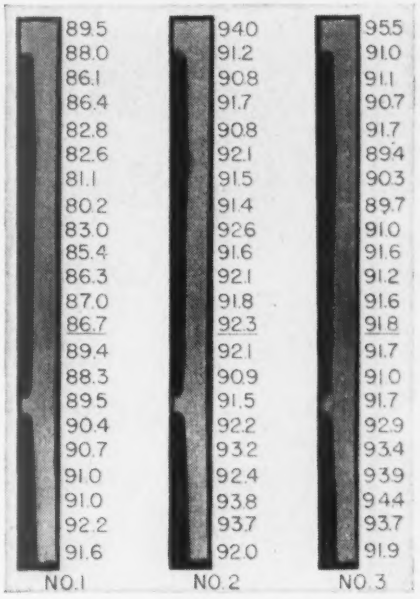

Fig. 2. Average Rockwell B hardness values at indicated positions in strip specimens from the bores of three cylinder block castings. No. 1-Untreated base iron containing 0.08% chromium. No. 2-Treated with 0.31% chromium added as Low-Carbon Foundry Ferrochrome. No. 3-Treated with 0.44% chromium added as Low-Carbon Foundry Ferrochrome.

The small chromium additions made in cylinders Nos. 2 and 3 had a marked effect in reducing the hardness spread and also in stabilizing the desired pearlitic structure in critical areas of the cylinder bore. This provided satisfactory resistance to wear in spite of difficulties introduced by an admittedly difficult design. Similar problems exist in most iron foundries—problems that Low-Carbon Foundry Ferrochrome can help solve with a minimum change in melting practice and at a very reasonable cost.

Booklets Available

Further information about this new ferrochrome is given in the booklets, "New Chromium Alloy Neutralizes Effect of Varying Cooling Rate in Gray Iron" and "Silicon-Chromium Alloy in Complicated Iron Castings." You may obtain copies, free of charge, by writing or phoning to the nearest ELECTROMET office: in Birmingham, Chicago, Cleveland, Detroit, Los Angeles, New York, Pittsburgh, or San Francisco. In Canada: Welland, Ontario.

*All Brinell hardness values were obtained by conversion from Rockwell B.

The term "Electromet" is a registered trade-mark of Union Carbide and Carbon Corporation.

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Smelting & Refining Division
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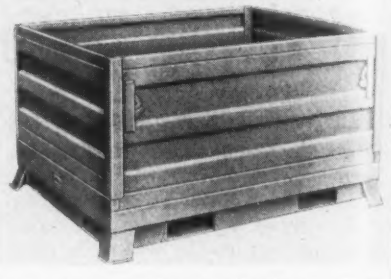
BUFFALO 23, NEW YORK

(*Continued from page* 238)

rougher handling without tearing than company's regular reproduction paper. Another feature is that lines may be erased readily when moistened. The paper can be handled on familiar reproduction equipment and in ordinary room light. It results in black-line prints from original drawings.

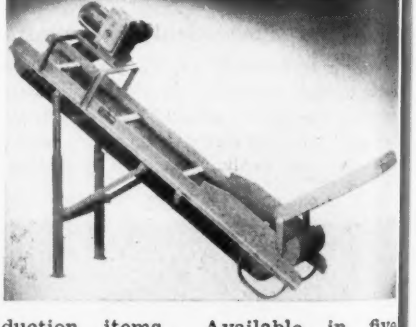
For More Details Circle No. 17—Page 235

Collapsible Box: Phillips Mine & Mill Supply Co., 2306 Jane St., Pittsburgh 3—Collapsible materials handling box, which can be dumped by a lift truck with revolving apron without slipping off the forks, is equipped with reinforced guide holes on all four sides for fork entry. Box has 5000-lb capacity and folds down to a collapsed height of less than 10 in. Built of heavy gage corrugated steel for rigidity at minimum weight, the box is held in the erected position by a safety lock with a safety catch. Leg design includes a small "table" on the inside to permit stability in stacking.



For More Details Circle No. 18—Page 235

Conveyor: May - Fran Engineering Inc., 1692 Clarkstone Rd., Cleveland 12—Conveyor designed for permanent or semipermanent installations will handle small metal parts. It is particularly useful as an auxiliary unit with a permanent conveyor system to feed or discharge high production items. Available in five lengths, the conveyor incorporates telescopic legs which permit the discharge end to be raised or lowered as required. In the 4-ft size, the discharge end can be raised from a minimum of 27½-in. to 37 in.; in the 6-ft size, from 37 to 57 in.; 8-ft length, from 40 to 70 in.; 10-ft con-



(*Continued on page* 243)

Dixon's *Balanced* Performance

saves money . . . speeds production!

UNEXCELLED

Long Life

PLUS

3 OTHER BIG FEATURES

"Yes, test after test by foundrymen, proves it!"

DON'T TAKE OUR WORD for it. Test a few Dixon "Carbond" Crucibles. Here's what we're sure you'll find:

That they cut costs, speed production, because—(1) they give *unexcelled* long life *under all conditions;* (2) keep clean on the inside; (3) take the heat well; (4) have good heat retentiveness. And this spells—the tops in BALANCED crucible performance!

Experience counts big in crucible making. And *only* Dixon gives you the benefit of *Over a Century of Crucible Experience!*

DIXON PRODUCTS

Crucibles
Stoppers
Refractory Cements
Base Blocks
Pre-Formed Furnace Linings
Furnace Covers
Ladle Liners
Specialties

JOSEPH DIXON CRUCIBLE COMPANY

Jersey City 3, New Jersey

DIXON'S CRUCIBLES — EXCELLENCE — D — SINCE 1827 — STOPPERS & REFRACTORIES

Over a Century of Experience **SPELLS THE DIFFERENCE**

HOW TO USE
FEDERATED PHOSPHOR COPPER
IN THE FOUNDRY

Use proper "oxidizing" melting practice. Always have a clear green flame over the furnace. Burn all the fuel and have some additional oxygen available in the products of combustion. Don't use any fluxes or covers.

After the crucible has been placed on the floor and skimmed clean twice, add two ounces of 15% phos copper per 100 pounds of melt just before pouring . . . stir in lightly and pour.

Federated phos copper, when used in this way for tin bronzes, leaded tin bronzes, and high lead alloys, reduces the possibility of porosity . . . increases fluidity or "castability" of the melt . . . gives sharper detail.

An illustrated wall chart on "How To Use Phos Copper" gives full details on proper foundry practice. The wall chart is available free on request. For your copy, write Federated Metals Division, American Smelting and Refining Company, 120 Broadway, New York 5, N. Y.

Federated Metals Division

Federated first in the non-ferrous field FMD

AMERICAN SMELTING AND REFINING COMPANY • 120 BROADWAY, NEW YORK 5, N. Y.

(*Continued from page* 240)

veyor, from 48 to 87 in., and 12-ft size, from 56 to 96 in. Belt widths may be 12, 18, or 24 in. Standard belting is neoprene-impregnated fabric, but a hinged steel belting can be supplied.

For More Details Circle No. 19—Page 235

Power Truck: Monroe Sales Corp., 333 Midland Ave., Detroit 23—Truck, powered by a 13-hp Wisconsin gasoline engine, is equipped with a 2000-lb capacity dumpable box designed for cupola charging. Box normally is locked in a horizontal position, but is unlocked by the operator as he approaches the cupola. It dumps only when contact is made with a bumper on the charging floor at the mouth of the cupola. Wheelbase of the unit is 56 in.; overall length 7 ft, 4 in.; width, 42 in. Distance from bottom of the box to the floor is 24 in. Drive wheels are equipped with hydraulic brakes. Heavy-duty 600 x 9

industrial tires are used. Other bodies include a flat bed platform and a 14 cu ft box for handling bulk materials.

For More Details Circle No. 20—Page 235

Flooring Material: Flash-Stone Co., 30 East Rittenhouse St., Philadelphia 44 — Synthetic rubber flooring material is said to have good strength; long life; high resistance to acids, alkalis, water, and point loads of considerable weight, and to be applied easily. It dries to a light concrete color and bonds with wood, metal, concrete, brick, slate, stone, asphalt mastic, composition, or similar bases. It is recommended for new floors or resurfacing old floors.

For More Details Circle No. 21—Page 235

Dirt Collector: Eberbach & Son Co., 200-06 East Liberty St., Ann Arbor, Mich.—Instrument for analyzing air pollution problems in industrialized areas is designed to tell the direction from which large quantities of dirt come. Known as a directional dirt-fall collector, the instrument collects heavy dirt from any direction the wind is blowing. For a reliable indication of the sources of heavy contamination the instrument

1. Cab-operated monorail hoists serve single bays or entire plants—from yards or unloading areas—without rehandling.

2. They operate "thru-the-air"—conserving floor space. Never interfere with production on the floor.

3. A wide range of trolley travel and hoisting speeds are available for adapting these machines to production requirements.

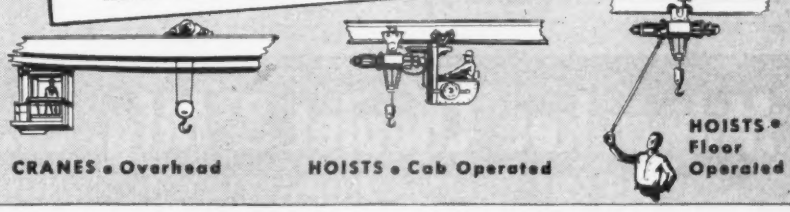
4. Operator always in the most favorable position for accurate spotting and stacking.

Shepard Niles specialists will study your operations—show you where and how you can speed up material handling with cab-operated monorail hoist service, and how you can save time and money while doing it. Write for additional information.

Shepard Niles

CRANE & HOIST CORPORATION

Makes and sells all three lifting tools for airborne shop loads



360 SCHUYLER AVENUE • MONTOUR FALLS, N. Y.

FAMOUS "Milwaukee thread stem" design has been skillfully engineered to permit the use of a heavier stem to insure proper core support without sacrificing fusibility. If you are working with pressure type precision castings, Milwaukee Chaplets are a "must" for improved production, fewer rejects, and all around excellence in quality.

Write for Samples and Prices.

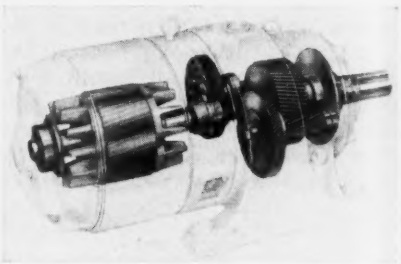
Milwaukee Chaplet & Mfg. Co.

1025 SOUTH 40th STREET • MILWAUKEE 4, WISCONSIN

must be exposed for 30-day collection periods over many months in a carefully chosen location representative of a given area. The amounts of collected material must be correlated with data obtained from the Weather Bureau to determine the relative amounts of dirt which have fallen per hour into the instrument from the various directions. The instrument was developed by Battelle Memorial Institute, Columbus, O.

For More Details Circle No. 22—Page 235

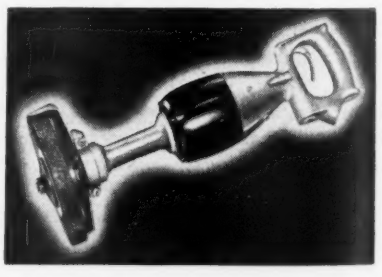
Geared Motors: U. S. Electrical Motors Inc., 200 East Slauson Ave., Los Angeles 54—New principle



in geared motors utilizes two secondary pinions to drive the output gear. Effective torque rating is said to be double that of a conventional single pinion and gear unit. Incorporating a splined herringbone pinion to divide the load equally between the two secondary pinions, the motor is said to produce high torque at low speeds. It is available with ratings of 5 to 25 hp and speeds from 30 to 84 rpm.

For More Details Circle No. 23—Page 235

Air Grinder: Ingersoll - Rand Co., 11 Broadway, New York 4 — Grinder contains a motor governor to maintain correct wheel speed, plus a built-in unit called the "overspeed safety coupling." In case the motor overspeeds because of governor wear,



abuse, maladjustment, or dirty air, the overspeed device automatically uncouples the arbor and the grinding wheel from the motor, making it impossible to operate the grinder until the cause of overspeeding has been corrected. Another safety feature is a multiple exhaust system. The operator can choose any one of four exhaust positions, spaced 90 de-

(*Continued on page* 247)

Thermex

ELECTRONIC CORE-BAKING EQUIPMENT

Saves $28,970 a year in core-baking

AT ONE PROGRESSIVE FOUNDRY* which replaced three conventional drying ovens with two THERMEX Core-baking Units, a cost comparison of old and new methods shows these results:

	COST COMPARISON	
LABOR FLOOR SPACE SAND & BINDERS UTILITIES MAINTENANCE REJECTS	100% WITH CONVENTIONAL OVENS	72.2% WITH THERMEX CORE-BAKING EQUIPMENT

This represents a saving of 27.8% for each 1000 pounds of finished cores. Based on the foundry's total production, *annual savings amount to $28,970. Thus the new THERMEX Core-baking Equipment will pay for itself in less than a year.*

Why not take advantage of this labor-saving, cost-cutting equipment? A THERMEX field engineer will be glad to show you engineering economy studies, based on installations like this, which give complete cost data. Write The Girdler Corporation, Thermex Division, Louisville 1, Kentucky.

*Name on request

THERMEX — T. M. Reg. U. S. Pat. Off.

Partial list of companies who have purchased THERMEX Electronic Core-baking Equipment

American Brake Shoe Co.
American Hardware Corp.
Brugger Manufacturing Co.
Crane Company
Ford Motor Co.
Grand Haven Brass Foundry
Grinnell Company, Inc.
Moline Malleable Iron Co.
National Malleable & Steel Castings Co.
Ontario Malleable Iron Co.
Phoenix Brass Fittings Corp.
Ronci Company
Sterling Faucet Company
United Foundries, Inc.
United States Pipe & Foundry Co.
Walworth Company

THE GIRDLER CORPORATION
Thermex Division

...low resistance
...like INTERNATIONAL GRAPHITE ELECTRODES

INTERNATIONAL *Graphite & Electrode* **CORP.**

A SPEER CARBON COMPANY SUBSIDIARY

ST. MARYS, PENNSYLVANIA

(*Continued from page* 244)

grees apart, and thus direct the exhaust away from the work and from his own body. The new grinder is said to be lighter, 20 per cent more powerful, and ten times quieter than previous models. Grinder is available for 5, 6, or 8 in. wheels, running at respective motor speeds of 4500, 4100, and 3100 rpm. Overall length is 24⅝-in. with straight handle and 22½-in. with grip handle. It has a maximum side to center distance of 2 5/16-in. and weighs approximately 16½-lb.

For More Details Circle No. 24—Page 235

Pyrometer: Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia 44—Thermocouple pyrometer to measure steel bath temperatures in open-hearth or electric furnaces consists of a platinum-platinum 10 per cent

rhodium immersion couple and a pyrometer with special signalling features. Thermocouple is mounted in a refractory-protected tube, supplied in 5 to 12 ft lengths. Tube holds a reserve supply of platinum wires. To replace the element, the operator loosens two clamps, pulls out wire for a new junction, and replaces the fused silica protective tip without disassembling the unit. The recorder operates a set of three signal lights, usually located near the furnace. The green light stays on as long as the thermocouple circuit is closed. The amber light, which comes on whenever the recorder pen moves upscale, shows that the couple is in operating condition. The red signal indicates when the couple registers actual bath temperature; it tells the operator when to withdraw the couple, without need for him to watch the pyrometer's record. Range is 2400 to 3200° F. A separate section at the left edge of the chart covers 0 to 200° F, affording a check on room temperature to show thermocouple condition.

For More Details Circle No. 25—Page 235

Battery Charger: Yale & Towne Mfg. Co., Philadelphia Division, 11000 Roosevelt Blvd., Philadelphia 15 — New industrial battery

BETTER CASTINGS . . . from BETTER CORES . . . from BETTER CORE OIL

(Just Like the House that Jack Built!)

Users of **PELRON** Core Oils report

- Smooth Castings—Less Finishing
- Increased Production—Quicker Baking at Lower Temperature—Time, Space and Fuel Costs Cut
- Higher Green and Baked Strength
- Easier Shake-Out
- Easy to Handle in Blown or Hand-rammed Core Boxes

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when core oil, core washes, and moistening agents are under consideration. We're always "looking for trouble"—looking for chances to help our customers lick their problems, build up our fund of knowledge and experience, fit ourselves to serve the Foundry Industry better, with improved products and methods.

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FOR GAS OR FUEL OIL

ARE MEETING EVERY EXACTING REQUIREMENT

FURNACES FOR
BRASS • ALUMINUM • MAGNESIUM
AND ALL OTHER
NON-FERROUS ALLOYS

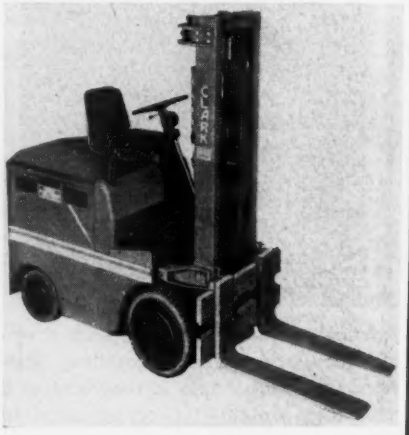
HAVE YOU INVESTIGATED THEM FOR YOUR MELTING PROBLEMS?

The Campbell-Hausfeld Co.
300-320 MOORE ST. HARRISON, OHIO

charger for units up to 55 amp-hr capacity operates on the selenium rectifier principle. It has no moving parts and incorporates an automatic controller, which governs the amount and time of charge. Temperature compensation is built into the charger to provide protection to both new and old batteries, whether fully or partially charged either in a cold or warm area. Available for either lead-acid or nickel-alkaline batteries, the charger can be plugged into any standard 110/115 v, 60 cycle outlet. A step-down transformer is furnished for 220-v outlets.

For More Details Circle No. 26—Page 235

Electric Trucks: Clark Equipment Co., Industrial Truck Division, 258 Champion St., Battle Creek, Mich. —A number of new features have been incorporated in the company's electric fork trucks. They include mounting of travel control lever on

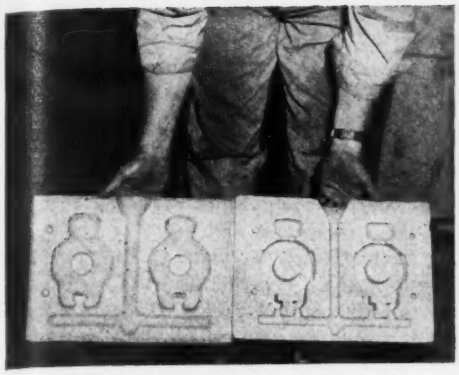


the steering column, automatic acceleration with shifts from one point of power to another timed automatically in accordance with torque requirements, and a "no-kick-back" steering axle which is pivoted on rubber torsional bearings. Specifications of the 4000-lb capacity model with lead acid battery are: Overall length, less forks, 76¾-in.; overall width, 41 in.; wheelbase, 44 in.; outside turning radius, 74 in.; minimum intersecting aisle, 66½-in.; service weight, less batteries, 5990 lb. Specifications of the 5000-lb model with lead acid battery are: overall length, less forks, 78 in.; overall width, 41 in.; wheelbase, 48 in.; outside turning radius, 78 in.; minimum intersecting aisle, 68¼-in.; service weight, less batteries, 6368 lb. Alkaline-battery-powered trucks also are available.

For More Details Circle No. 27—Page 235

Paint: Paint Corp. of America, Fidelity Bldg., Cleveland 14—Penetrating and sealing antirust paint for interior and exterior use is said to be equally effective in preventing rust

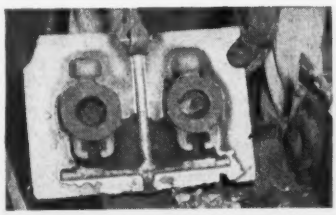
(*Continued on page* 250)



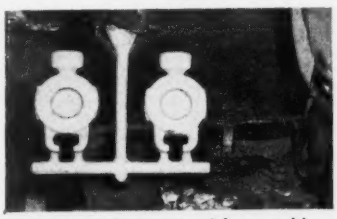
Resin bonded shell mold showing back (left) and face (right).

How to boost your production:

Use Monsanto Resinox resins with new shell molding process



Removal of casting from mold.



Casting after removal from mold.

Not only does the Shell Molding ("C") Process help you speed up production, but it enables you to get castings with a superior finish . . . and castings with dimensional accuracy comparable to that achieved by precision casting techniques. And there are other advantages you will want to look into:

1. Better metal yields (more castings per pound of metal poured)
2. Castings requiring little or no cleanup
3. Less sand handling
4. Excellent castings of intricate shapes and thin sections

Monsanto manufactures a wide range of Resinox phenolic resins research-built for the Shell Molding Process, and others already used by many foundries to improve cores, and reduce baking cycles up to 50%. *For more information about the new Shell Mold Process, and for data on Resinox for molds and core binding, please send the coupon below.* Resinox: Reg. U. S. Pat. Off

MONSANTO
CHEMICALS AND PLASTICS

SERVING INDUSTRY. . . WHICH SERVES MANKIND

MONSANTO CHEMICAL COMPANY, Plastics Division,
Room 5705, Springfield 2, Mass.

☐ Please send me your booklet, "The 'C' Process for Making Molds and Cores for Foundry Use."

☐ Please send me information on Resinox for _____

Name & Title _____

Company _____

Address _____

City, Zone, State _____

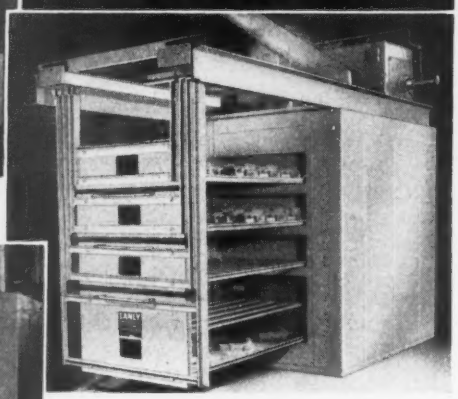
These Endorsements are your ASSURANCE of COMPLETE SATISFACTION

with LANLY OVEN SERVICES

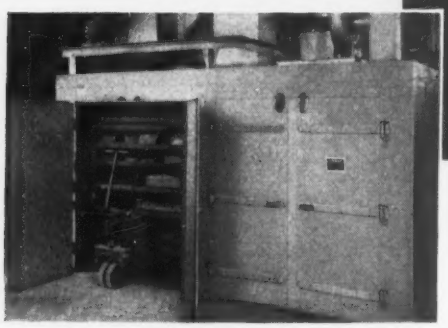
Here are some typical LANLY FOUNDRY OVEN USERS

ALLEGHENY LUDLUM STEEL CORPORATION
ALUMINUM COMPANY OF AMERICA
ATLANTIC FOUNDRY COMPANY
BURNHAM CORPORATION
COMMERCIAL STEEL CASTING COMPANY
DEMING COMPANY
FAIRBANKS-MORSE COMPANY
JEFFREY MANUFACTURING COMPANY
JESSOP STEEL COMPANY
NATIONAL MALLEABLE & STEEL CASTINGS COMPANY
NATIONAL SANITARY COMPANY
NORTH AMERICA AVIATION COMPANY
PERMOLD COMPANY
SHENANGO-PENN MOLD COMPANY
UNIT CAST CORPORATION
WELLMAN BRONZE & ALUMINUM COMPANY
WILSON FOUNDRY & MACHINE COMPANY
WORTHINGTON PUMP & MACHINERY CORPORATION
YOUNGSTOWN FOUNDRY & MACHINE COMPANY

Car Type Core and Mould Oven



(Above) Drawer Type Oven



(Left) Two Compartment Rack Type Oven

Production-proved LANLY installations for CORE BAKING, PASTING and MOLD DRYING as well as OVENS and AIR DRAW FURNACES for CASTING CONDITIONING and HEAT TREATING are in operation daily throughout the country.

We'll gladly submit a recommendation in the light of your specific operational plan. LANLY standard units will merit your investigation. CATALOG available upon request.

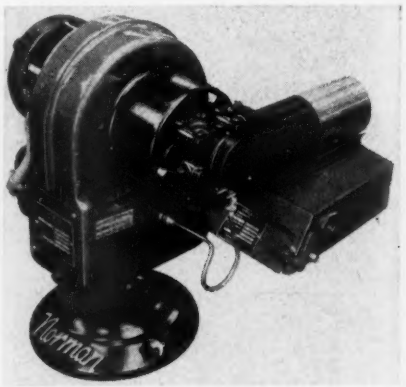
THE LANLY CO.
OVENS FOR INDUSTRY
HEATED BY GAS, OIL, ELECTRICITY OR STEAM
780 PROSPECT AVENUE CLEVELAND, OHIO

(Continued from page 248)

on new metal or stopping rust action on present rusted metal. It can be applied over rust without extensive surface preparation such as wire brushing, scraping, or sand blasting, it is claimed. Upon application, it penetrates through the rust layer into the base metal and seals the surface against further rusting. It may be brushed or sprayed. Paint is furnished in black only and, due to its penetrating characteristics, should be used solely as a finish coat. Companion product, a clear paint equally effective for rust prevention, can be painted over with any standard paint of any color.

For More Details Circle No. 28—Page 235

Oil-Gas Burner: Norman Products Co., 1150 Chesapeake Ave., Columbus, O. — Combination burner switches automatically from gas to oil and back as determined by an outside thermostat set at the temperature point at which the gas utility expects service difficulties. Also, the



burner can change fuels automatically depending upon drops or rises in pressure of the gas line. The oil burner can be used for the initial start up of each firing period. As soon as proper stack temperature is reached the gas valve automatically opens, putting positive gas pressure in the gas manifold, breaking the oil burner circuit as soon as gas pressure is established. This is said to insure a positive oil flame for ignition and adequate gas pressure before gas is ignited. Inversely, when gas pressure drops, unexpectedly, the oil burner is brought into use immediately and automatically, guaranteeing continued high heat. Burner is available in seven sizes from 80,000 to 3 million Btu capacity.

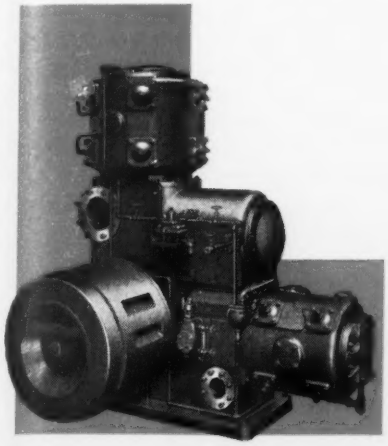
For More Details Circle No. 29—Page 235

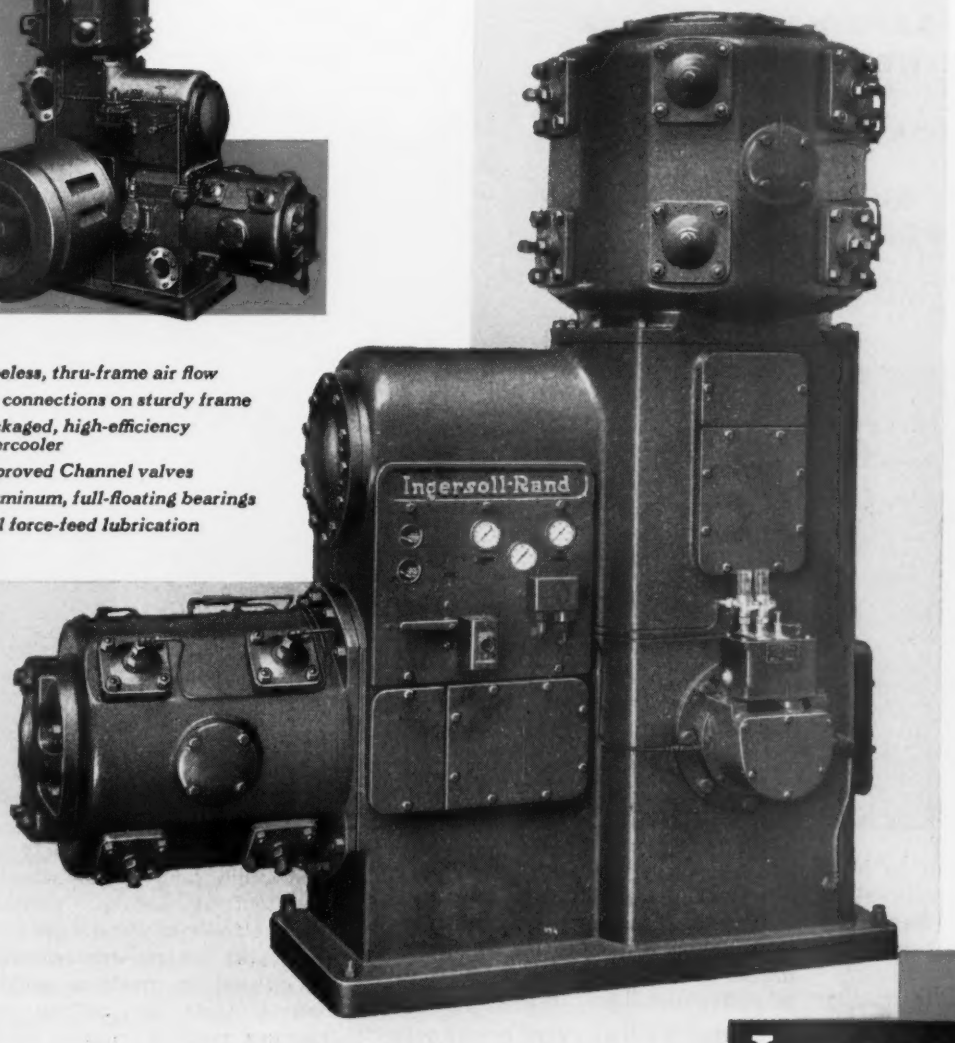
Rod Straightener: American Wheelabrator & Equipment Corp., 505 South Byrkit St., Mishawaka 2, Ind.—Core rod straightener and shear machine has two heavy alloy steel

(Concluded on page 252)

HERE'S A *NEW IDEA* IN ELECTRIC-DRIVEN AIR COMPRESSORS

that means lower costs of Installation, Operation and Maintenance





- *Pipeless, thru-frame air flow*
- *Air connections on sturdy frame*
- *Packaged, high-efficiency intercooler*
- *Improved Channel valves*
- *Aluminum, full-floating bearings*
- *Full force-feed lubrication*

A Packaged
"L" DESIGN

●

THE SIMPLEST
MOST COMPACT
MOST ACCESSIBLE
MOST ECONOMICAL
READY-TO-RUN
HEAVY-DUTY
CROSSHEAD-TYPE

●

TWO-STAGE
80 to 125 psi

●

SIZES
125 to 350 hp

Ingersoll-Rand

XLE

507-1

The XLE incorporates a "new look" and a new idea in air-compressor design. It is a heavy-duty, well-balanced, easy-to-keep-clean machine that can be installed with an absolute minimum of effort, time, and cost . . . on a minimum of foundation.

Simplicity of XLE construction, and advanced-design features such as aluminum-alloy full-floating bearings that require no adjustments in a sealed, dust-tight crankcase, result in lower-cost maintenance and a higher degree of dependability.

The XLE is a highly efficient compressor built for continuous, full-load operation, and is ideal for factories, railroad shops, mines, powerhouses, and large construction jobs. It is particularly suitable wherever skid-mounting, factory floor, or ground conditions require a well-balanced machine.

FOR MORE INFORMATION on XLE Air Compressors, phone or write the Ingersoll-Rand office nearest you, or write . . .
INGERSOLL-RAND, 11 Broadway, New York 4, N. Y.

ROCK DRILLS • AIR & ELECTRIC TOOLS • OIL & GAS ENGINES • PUMPS • TURBO BLOWERS

Ask STANDARD CONVEYOR

How you can cut costs • speed operations • gain:

- ✓ REDUCED HANDLING TIME
- ✓ UNINTERRUPTED SMOOTH FLOW IN PRODUCTION
- ✓ CAREFUL, SAFE HANDLING OF LIGHT OR HEAVY MOLDS—
- ✓ BETTER STORAGE FACILITIES
- ✓ CONSERVE AND UTILIZE EXISTING FOUNDRY SPACE

Conveyors are unequalled in low first cost, flexibility of application for a variety of foundry handling needs, minimum operating or maintenance expense.

Foundry conveyors are designed and built in their entirety by Standard including the vital bearings, sealed and shielded—expressly designed for severe foundry service.

Available in a wide range of sizes, weights and types — as complete systems—or individual portable sections. Whatever your specific need, Standard is qualified by experience and facilities to recommend and furnish the right type of conveyors.

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Send for Standard's special catalog "Conveyors for Foundries" — a valuable reference book illustrating and describing conveyor installations in leading foundries.

Engineered Conveyor Systems — Portable Conveyor Units — Spiral Chutes — Pneumatic Tube Systems

EQUIPPED WITH SEALED AND SHIELDED BEARINGS
SPECIALLY DESIGNED FOR FOUNDRY SERVICE

(*Concluded from page* 250)

dies, one movable and the other stationary. The dies close as a contracting square upon the rod and straighten it by a blow delivered simultaneously on four sides. After the straightening process, the rods can be sheared on the machine to desired length. Big kinks in rods can be removed first in the bending jaws of the machine. Machines are available in four sizes. Rods from ⅜ to 2½-in. diam can be straightened and rods up to 1½-in. in diam can be sheared. A special gagger-forming attachment is available as optional equipment. It is built to accommodate rods up to ⅝-in. in diam and make a right angle bend in one operation. Compressed air at 90 psi, minimum, will operate the machine.

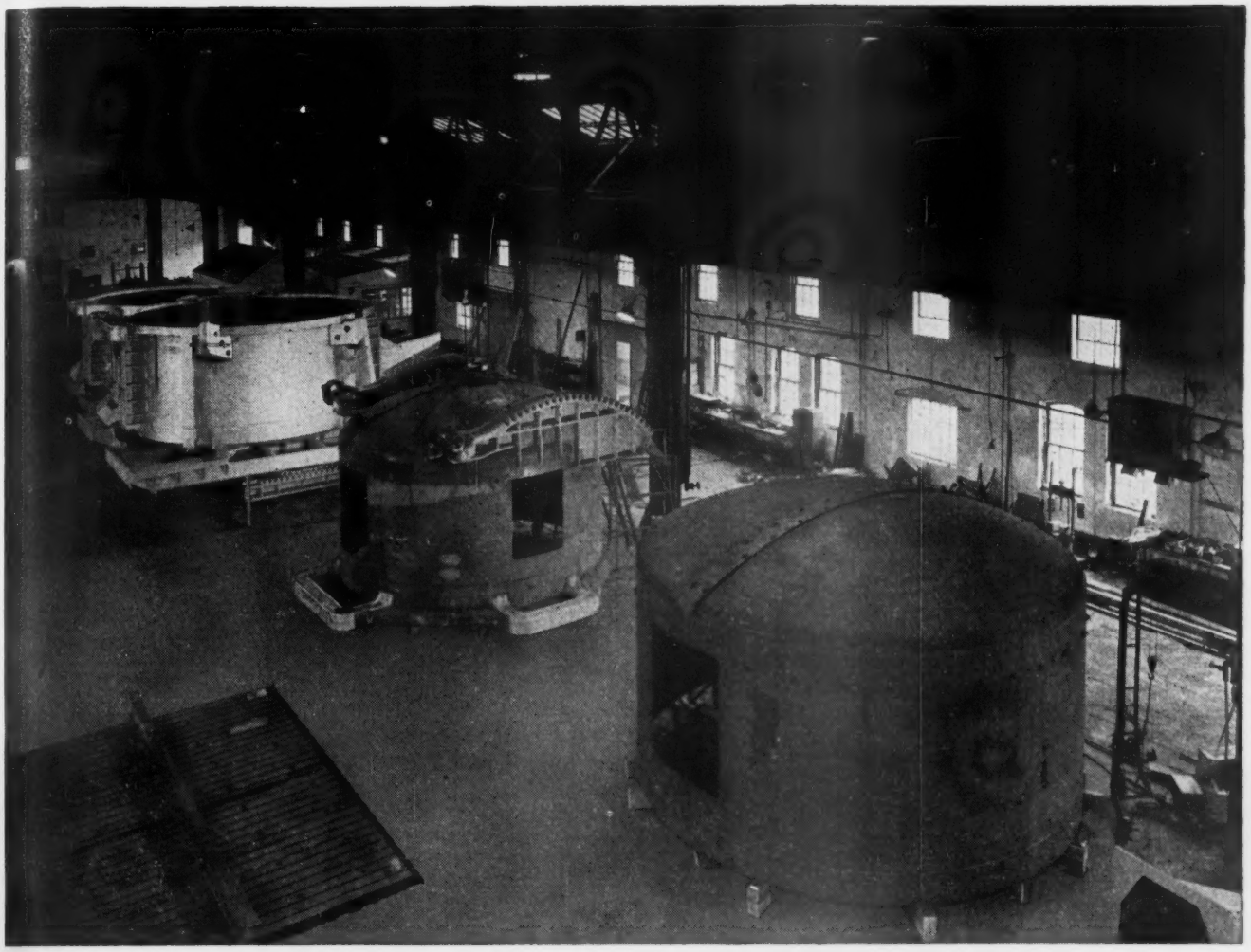
For More Details Circle No. 30—Page 235

Grinding Wheels: Chicago Wheel & Mfg. Co., 1101 West Monroe St., Chicago 7—New grinding wheel bond, designed especially for tungsten carbide tool sharpening, is said to produce tough, long lasting wheels with good cutting action. Supplied in straight and cup wheel sizes and steel backs, the wheels are recommended for offhand or precision grinding of carbide tools on milling cutters, broaches, reamers, counter bores, and other similar applications.

For More Details Circle No. 31—Page 235

Accelerator: Rezolin Inc., 4825 West Jefferson Blvd., Los Angeles 16 — Liquid accelerator is said to give high physical properties to casting resins. Company also claims that the addition eliminates use of ovens and overnight hardening, permitting high-speed production of master models, foundry patterns, jigs and fixtures. Hardening time is controlled by increasing or decreasing the amount of additive used.

For More Details Circle No. 32—Page 235



CAPACITY TO BUILD 'EM BIG

Lectromelt builds BIG furnaces that get to work FAST. Our shop assembly practice is responsible; here in our big Pittsburgh plant your Lectromelt* furnace is completely assembled and mechanically operated before we ship it to you. Even the bus bar is pre-assembled. All this saves you time in erection, cuts down installation cost, gets you into production faster.

Lectromelt furnaces stay in production longer, because they have all these built-in features:

top-charging design*—speeds production, cuts electrode consumption, saves power, lengthens lining life; *counter-balanced electrode arms; engineered power supply and regulating apparatus,* designed to stand up to punishing overloads; *oil-bearing mounted superstructure; side-mounted tilting mechanism.

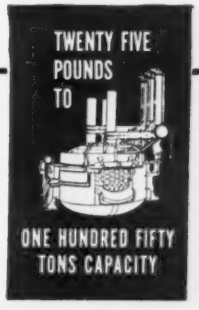
Whatever your melting problem, Lectromelt has the furnace to handle it. Write for your free copy of our Catalog No. 8 to Pittsburgh Lectromelt Furnace Corporation, 314 32nd Street, Pittsburgh 30, Pa.

Manufactured in . . . CANADA: Lectromelt Furnaces of Canada, Ltd., Toronto 2 . . . ENGLAND: Birlec, Ltd., Birmingham . . . SWEDEN: Birlec, Elektkougnar A/B, Stockholm . . . AUSTRALIA: Birlec, Ltd., Sydney . . . FRANCE: Stein et Roubaix, Paris . . . BELGIUM: S. A. Belge Stein et Roubaix, Bressoux-Liege . . . SPAIN: General Electrica Espanola, Bilbao . . . ITALY: Forni Stein, Genoa.

*REG. T. M. U. S. PAT. OFF.

MOORE RAPID

WHEN YOU MELT... *Lectromelt*



By ERNEST W. FAIR

How often Plant Inspection?

EVERY executive knows plant inspection pays dividends. However, a great many have found too much inspection can prove costly. So also can too little inspection. The objective is to find the happy medium where plant inspection provides greater savings than it costs. To reach this goal it is necessary to make the time interval between inspections long enough to reduce costs but still short enough to discover defects before they can cause damage.

Some equipment can be inspected visually daily or weekly with speed and assurance of effectiveness and this can be supplemented by detailed inspection once a year. Steam lines, for example, may be visually inspected as a part of daily plant routine to discover leaks and outward tightness of insulation, but a close instrument check should be made at least once a year to determine insulation efficiency.

An inspection of electric motors can be made weekly or monthly to determine cleanliness, commutator condition or normal heat rise, but motors should be given a thorough take-down inspection at least each six months; in conditions where they are subject to particularly severe service such a break-down inspection is advisable every three or four months.

Buildings themselves should receive continuous inspection but do not need a thorough inspection more than every six months and possibly even a year except where climate, age, foundation and equipment housed are such as to make more frequent inspection obvious. The newer the building the less frequent the inspection. As the years go by and the building ages it will, of course, be found that thorough inspections should be made at more and more frequent intervals.

Westinghouse Electric Corp. in setting up its schedules for routine inspection lists the following as being subject to continuous inspection: All construction, completed jobs, yards, drinking fountains, piping, electric wiring, ladders, electric signs, roofs, fire doors, and general safety.

General Foods Corp. in one of its inspection charts lists the following intervals: General plumbing—monthly; roof sumps—monthly; vacuum pump strainers—monthly; humidifiers—daily; flow meters—daily; air lines and drip traps—daily; ball-bearing motors—six months; motor-operated valves—six months, and ventilator fans—three months.

Inspection intervals for much other plant equipment as used by a number of similar concerns include such suggestions as these:

Weekly—pressure tanks, ventilating equipment, exhausters, blowers.

Monthly—cranes, jibs, elevators, dumbwaiters, conveyors, special lifting devices, blocks, hoists, switchboards, tunnels, melting pots, ovens, furnaces, welders, cables, power transformers.

Quarterly—test floors, cable tunnels, sewers, tanks, floor loadings.

Semiannually—outdoor units, lines, fences, bridges, walks, driveways, fire escapes, stacks, safety set-ups.

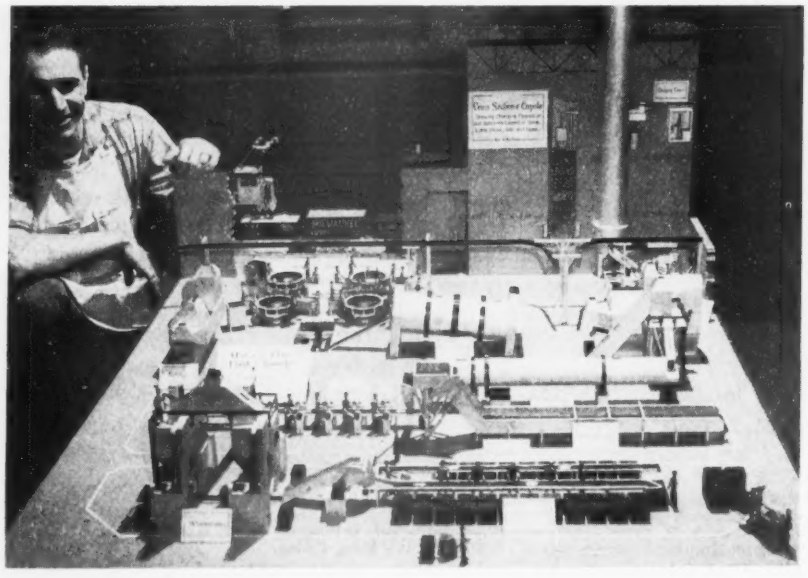
Building roofs should be inspected at periods of from three months to two years depending upon their usage, age and general condition. Immediate inspection of such properties as roofs is always advisable after any severe storms or other weather conditions which may cause serious damages. This is particularly true after heavy snow or ice conditions, sleet storms or even very heavy rain. An immediate inspection after passing of the condition will generally warrant the time and expense necessary to make that inspection.

Usage determines how frequent floor inspections should be made. Consideration also must be given the type of floor. Where floors are old and subject to heavy usage a monthly inspection is not too soon. On the other hand where floors are new, designed and constructed of latest material developments and where usage is not too great a six-month inspection is generally adequate.

Paint should be checked closely at stated intervals, six months being the overall time most firms use, not only for condition but for light reflecting capacity and cleanliness. Paint costs can be kept down by inspections made at sufficiently frequent intervals to discover immediate need for remedy of a situation that has developed.

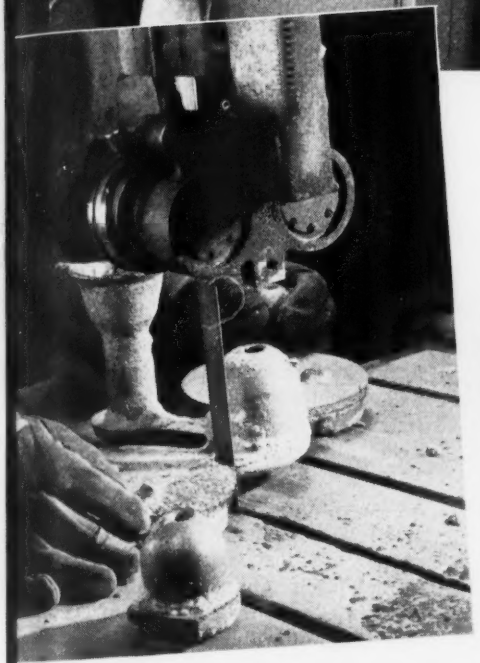
Dependability of electrical equipment and fixtures is enhanced by the more frequent inspection that can be

(*Continued on page* 256)



FOUNDRY MODEL: Scale-model replica of the gray iron permanent mold foundry at Delco-Remy Division, General Motors Corp., Anderson, Ind., is part of a larger industrial exhibit sponsored by that company. It was built by Paul Meagher, Delco-Remy patternmaker, shown at left. Balance of the exhibit showed some of the products cast in the foundry and several cross-sectional views of the permanent molds and cores used in making the castings

SPEED UP GATE REMOVAL with DoALL FRICTION SAWING!

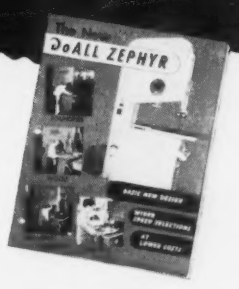


THE speed of DoALL Zephyr Band Machines for removing gates, risers, flash and other superfluous material from castings will surprise you. DoALL Zephyr Band Machines are fast: they have actually saved as much as 90% in time and tool costs, depending on the thickness of the work. With DoALL you are able to get into complicated spaces and cut *close* to the casting and as finish is generally of high quality, grinding can be either eliminated or materially reduced. The cut is made fast enough so as not to allow heat penetration into the side wall of the finished cut and skin hardness never exceeds .003" deep. Zephyr Friction Sawing means low tool cost and greater tool safety for the operator.

Where extremely fine tolerance and optimum efficiency is desired, automatic hydraulic feeding tables are available. There is a size DoALL Zephyr for every pocketbook and for almost every problem. If you have a special problem we will cooperate with you in tailoring saw design to solve it. Here are advantages you should look into. Ask for a free demonstration in your own plant. Call our local DoALL Sales Service Store or write.

THE DoALL COMPANY, 254 N. Laurel Ave., Des Plaines, Ill.

SEND FOR CATALOG



Above: Here is a DoALL Zephyr in a typical installation removing dead metal.

Below: With DoALL Friction Sawing you can cut close to the live metal and reach the hard-to-get-at places.

There is quite a story on costs and speeds in handling castings of various thicknesses. Ask for complete details with a catalog on DoALL Modern Band Machines.

BMF-1

DoALL

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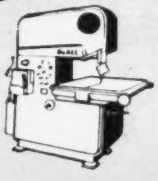

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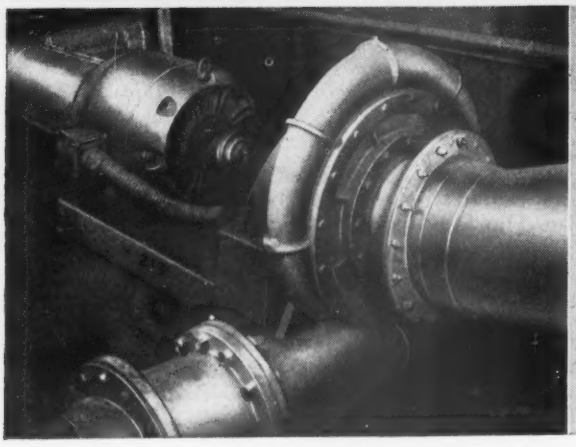
Keep your eye on V-P-I WHEN SELECTING BLOWERS



CENTRIFUGAL

Type OIB Centrifugal Blower for cupola service in western foundry. Capacity 6,000 cfm.

You can't afford to risk cupola shutdowns today because of unsatisfactory or inadequate equipment performance. To keep production moving at the required fast pace, calls for blowers that continuously deliver positive Volume at required Pressure —and at Low power costs to reduce operating expense.

You get these 3 essentials from R-C Blowers. Whether your needs call for Centrifugal or Rotary Positive units, we can match them from our exclusive *dual-ability line.* With capacities from 5 cfm to 100,000 cfm, you can usually find R-C units that closely fit your demands, with resultant savings in time, cost, space, weight and power.

From an experience of almost a century of blower building, our engineers will gladly make suggestions of the right R-C equipment to keep cupolas going at top capacity to meet today's urgent demands.

ROOTS-CONNERSVILLE BLOWER CORPORATION
510 Madison Avenue, Connersville, Indiana

ROTARY

RCS Rotary Positive Blower with capacity of 4,500 cfm, used to supply cupola air in locomotive plant. Other R-C Blowers are shown in background.

ROOTS-CONNERSVILLE

BLOWER BUILDERS R-C SINCE 1854

ONE OF THE DRESSER INDUSTRIES

(*Continued from page* 254)

given them. Such units too often are taken for granted and heavy costs may be incurred in break-down repair and plant idleness that could have been avoided by more frequent maintenance inspection. A maximum period of three months has been found advisable and, if possible to do so, a monthly inspection of heavier units in particular has been found to be best.

Power control equipment, on the other hand, requires much more frequent inspection because of the heavy use to which it is subjected and also because we can less afford break-downs here than anywhere else. An inspection every four weeks is advisable and in any case no longer than every three months.

Monthly inspections should also be made on all heating equipment and high-pressure steam equipment. If possible the latter could well be inspected every two weeks.

Need More Inspection

Ordinarily protection equipment such as fire fighting apparatus is inspected far too infrequently. Too many firms pay attention to such units only once a year. The necessity for such units being in constant readiness for use impels much closer inspection, at least once each three months. In the case of fire extinguishers a weekly inspection is most often advised.

Materials handling equipment should also be inspected at least once a week, not only to insure continued efficient operation but to minimize all possible chances for costly accidents in their use.

Each individual plant operates under different conditions than its neighbors. Devising an overall frequency of inspection chart for universal use might prove more damaging than useful. The best procedure is to take the proven experience as presented here and adapt it to the own individual plant and its equipment.

In planning such a schedule due consideration should be given to the age of such equipment, for the older the equipment the more frequent inspection is advised. More frequent inspection is also needed where plant maintenance routine is on a haphazard basis. Conditions of heavy usage, of production beyond rated capacity, of equipment used by learners or beginners and of frequently repaired units must also enter into such calculations.

Our object is to provide as frequent and thorough an inspection as

(*Concluded on page* 258)

For cupola linings, regular maintenance or emergency repairs

HARBISON-WALKER PRODUCTS

are available for every requirement

H-W KUPLOMIX is receiving wide acceptance as an easy-to-apply cupola lining material that renders exceptionally satisfactory service. Because cupola linings require regular maintenance and patching, the outstanding performance of H-W KUPLOMIX accounts for the worth-while cost reduction. H-W KUPLOMIX applied by means of air placement guns or by hand ramming produces a durable, monolithic lining which requires only a very short time for installation.

From the complete line of Harbison-Walker Foundry Refractories, you can select the particular products that will best suit your own needs.

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Conventional and H-W Universal Cupola Blocks in all classes of refractories, including Super-Duty, High-Duty and Siliceous Fireclay brick.

Monolithic Ramming and Patching Materials.

For your LADLES

All classes of fireclay brick

H-W Black Patch

H-W Plastic Fire Brick

Silica and Fireclay Ganister

Fire Clays and Bonding Mortars

For your FURNACES

Refractories for Electric, Malleable Iron and other Foundry Furnaces,

including

Fire Clay, High-Alumina, Silica and Basic Refractories,

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Insulating Fire Brick, Castable and Plastic Refractories, Bonding Mortars, and Furnace Bottom Materials.

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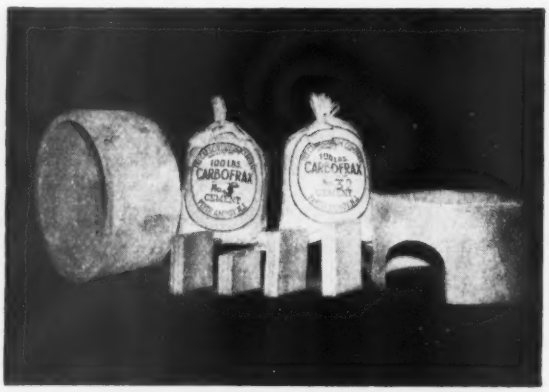
Cement, Segments, or Rings



All 3 make top quality linings for non-ferrous crucible furnaces.

CARBOFRAX silicon carbide linings substantially outlast and outperform other materials. Essentially, the reasons are:

- CARBOFRAX material is one of the most durable refractories known. Its unusual resistance to softening, cracking, and spalling prevents frequent patching — gives maximum lining life.
- By using CARBOFRAX rings or segments, thinner linings — and heavier insulation — can be used. As a result, it takes less fuel to turn out more melts.
- CARBOFRAX linings can be installed very easily, very quickly.

Write today for further information.

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Dept. A-101, Refractories Div. • Perth Amboy, New Jersey

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(*Concluded from page* 256)

is needed to make certain of the continued efficient production of equipment and yet at a not too frequent interval which may prove just as costly as total neglect in running up plant overhead.

The Pattern Engineer And the Foundry

(*Continued from page* 103)

tations on equipment to produce 200 castings. One shop quotes $25 for a single, one-piece pattern. Shop No. 2, noting the pattern can be split, quotes $35 for a split wood pattern. Shop No. 3, noting that 200 castings are wanted, checks the foundry for flask sizes on hand in the pattern range, and quotes $65 for a hard wood match-board of one pattern to fit a certain flask. Also, finding that the casting is to be a repeat number, quotes $165 for an aluminum matchplate of two patterns, to fit a flask on hand.

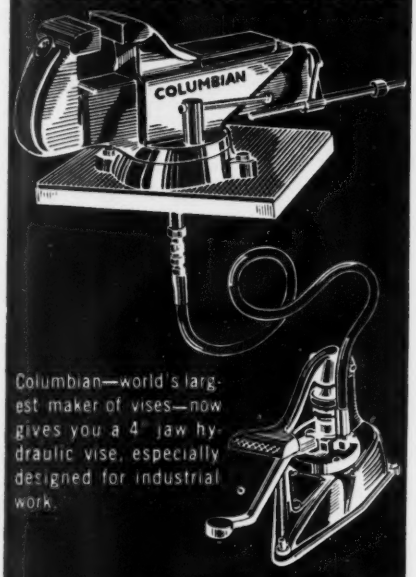
In checking costs for the various equipment, the purchaser finds: Shop No. I wants $25 for a pattern from which castings will cost $1 each, a total of $225. Shop No. 2 wants $35 for the pattern, and $0.92 each for the castings, a total of $219. Shop No. 3 wants $65 for a wood matchboard pattern and $0.70 each casting or $205 for the job. Also Shop No. 3 asks $165 for metal pattern equipment and $0.60 each casting, a total of $285 for the lot.

It will take no time to discard the quotations of Shop Nos. 1 and 2. The only thing to decide is whether to spend $80 more on the first order to insure the lowest cost on all subsequent castings and have permanent metal equipment, or to take the lower first cost with a fair re-order casting cost. It is unnecessary to point out that Shop No. 3, while quoting a higher pattern cost, got the job and made a good impression on the purchasing agent.

It will also be found that in most cases a purchaser can and will extend the time limit on patterns to gain a good unit cost. This is particularly true when multiple pattern equipment will enable the foundry to produce subsequent orders at a much faster rate.

However, do not design equipment to be used with jolt squeeze machines and core blowers when the foundry which will use the pattern is a hand shop, or to make equipment to produce 1000 cores per day when the foundry will not be able to use 100 per day. In short, consider the mech-

COLUMBIAN
Hydraulic Vises meet every industrial need!



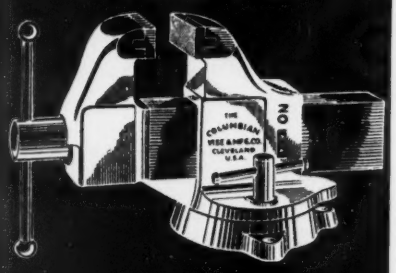
Columbian—world's largest maker of vises—now gives you a 4" jaw hydraulic vise, especially designed for industrial work.

Its use enables operators to employ both hands to handle and position work. Vise is controlled by two simple foot pedals—one for power, the other for release. Stop control is adjustable so that castings are gripped and held with a single power stroke.

Vise closing speed is ⅞" per pump stroke. Jaws close without damaging the lightest castings. Full vise opening can be accomplished in 3 seconds.

Maximum hydraulic pressure is 7,000 P.S.I. Maximum jaw pressure is 4,000 lbs. (2 tons). A safety valve protects against overloading.

WRITE FOR FULL DETAILS, ASK FOR BULLETIN HV-7548-R.



In addition to hydraulic vises, Columbian manufactures a complete line of machinists' hand vises in 3" to 8" jaw widths.

COLUMBIAN Vises
THE COLUMBIAN VISE & MFG. CO.
CLEVELAND 4, OHIO
world's largest maker of vises

anization of the foundry as well as production.

There also is the need for each of us to co-operate within our own organizations. When a new job comes in, whether it is a pattern already made or a print for a new pattern, the foundry superintendent, molding foremen, core foremen, and pattern foremen, or pattern job shop boss, should get their heads together to figure out the various points which have been discussed.

Every effort should be made to see that the new equipment is so designed that the coremaker will like to use it, that molder will have no difficulty knowing which core goes where. Make loose pieces so they can be placed on the pattern readily. Refrain from using dowels as a means of holding them in place. A dovetail cut into the pattern costs slightly more than drilling a hole or two for dowels, but you do not run the risk of losing castings because of a misplaced loose piece. Suppose there are six identical bosses that must be loose pieces. Then make all the locating dovetails identical. In this way the molder will not spend valuable time hunting locations.

Be sure core prints are adequate. Do not expect a large core to stand up and stay put in a small print. Also remember gases must flow off through the prints, so make them of a size that is adequate. Give the prints distinctive locating witnesses. Don't ask the molder to hunt for a core that will fit. In short, *think,* and use all the combined thinking available.

If we do these things, the foundry industry will grow and be a better place in which to work.

Iowa U. Offers Course In Quality Control

A ten-day course in quality control by statistical methods, sponsored by the College of Engineering, State University of Iowa, will be given Oct. 23 to Nov. 2, inclusive, at Iowa City, Iowa. This is the ninth course offered by the university and is designed for persons in a supervisory position and where the knowledge gained can be applied immediately.

Fee for the course, including books and supplies, is $100. Trainees will be expected to provide for their own living expenses and transportation to and from Iowa City. The number of trainees in the course will be limited. Additional details can be obtained from Prof. Lloyd A. Knowler, department of mathematics, State University of Iowa, Iowa City, Iowa.

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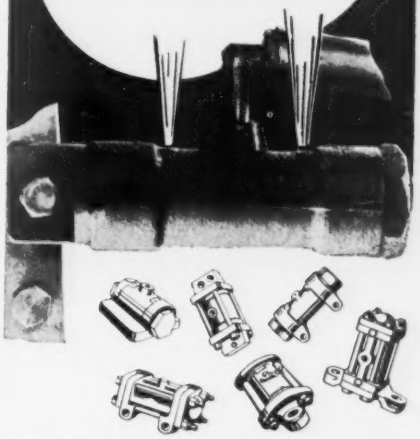

For shake-out jobs or materials handling operations, it's the rapid-fire hammer-like blows of SPO AIR VIBRATORS that keep production lines moving.

ONLY SPO air vibrators incorporate a special pressed metal cylinder liner which provides for permanent lubrication, long service life and maximum efficiency of operation.

There is a SPO AIR VIBRATOR for every vibration need, and the complete line of SPO includes models and capacities to meet all foundry requirements.

So when powerful, low-cost vibration is needed, specify SPO air vibrators. Remember — BLOW FOR BLOW, YOU CAN'T BEAT A SPO.

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ALUCO "S" is specially compounded for die casting aluminum base metal and permanent mold castings.

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Casting Surfaces in Olivine Molding Sand

(*Continued from page* 113)

easily and cleanly and resulted in smooth surfaces. A sketch of the metal mold interface (Fig. 6) will serve to indicate why this result might be expected.

Fig. 6 shows two sand grains at the metal mold interface. For clarity, the section does not include the third dimension, but the argument would be essentially the same for the actual situation. As the liquid metal flows over the mold face it will not flow into every crevice but will tend to bridge over when the combination of surface tension and skin strength are sufficient to subtend the particular distance between the points of contact. When the pressure head increases the skin will yield and will be forced further between the grains, giving a rougher surface.

For the fine-grained sand the distance between points of support was so small that the pressure used could not cause any detectable difference in roughness. A greater pressure may give a noticeable difference in roughness.

Sand Grains Differ

With a uniform spherical grained aggregate rammed to a continuous dense surface the roughness should be uniform because the pore areas would be approximately equal. With an angular grained aggregate, the condition is different, as can be seen in Fig. 7. In this case the distance between points of support is dependent not only on the mean diameter of the grains, but also on the orientation of adjacent grains. Thus roughness will be more pronounced with an angular grained than spherical grained sand of given size for a given pressure. The protruding roughness points for the angular sand should be more or less at random which is in agreement with actual results.

Another basic difference between spherical and angular grained sands is that the latter has a different effective size than will appear from a screen analysis. The sand that remains on a particular screen is not of uniform dimension in all directions and the maximum dimension may be several times the mean. Thus an angular sand consisting of only one screen size has effectively a range of sizes depending on the range of dimensions measured in all directions and the minimum size will approach the nominal screen size. Stated another way, an angular grained sand concentrated on one

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in the foundry field who are using Scientific Pressure Cast Matchplates for increased production at lower costs.

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screen is equivalent to a spherical grained sand that is distributed over several screens with a minimum size equal to the angular sand screen size. This effect is superimposed on the one discussed previously.

Medium Sand—The medium grained sand gave a rougher surface than did the fine sand, as Fig. 11 indicates. This is consistent with the discussion in the previous section. The 4 per cent clay series has the roughest surface in the center of the moisture range and is not as rough for the higher and lower moisture contents. Because the permeability has a similar characteristic there is an apparent correlation between roughness and permeability. This is reasonable because the same factors that increase permeability also increase roughness. That is, any factor that would tend to hold the grains of sand further apart would increase roughness and also permeability.

The 1 per cent clay series seems to contradict this thesis. In this case there is no detectable difference in roughness, although the range of permeabilities is about the same as for the 4 per cent clay. A further analysis may clarify this situation.

Permeability is a function of the average resistance to flow of air through the entire length of the specimen. The roughness observed is due to the interface conditions only. Thus two specimens with exactly the same permeabilities may give different degrees of roughness and, conversely, two specimens with different permeabilities may have the same degree of roughness.

The results of the medium grained sand tests may then be interpreted to indicate a difference in density gradient through the specimens of the 1 per cent and 4 per cent series.

Coarse Sand—The coarse sand produced very rough surfaces (Fig. 12). The roughness correlated fairly well

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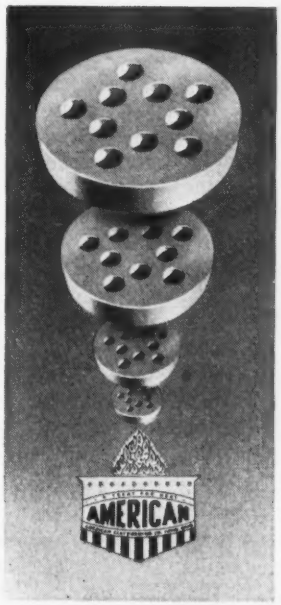

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with the permeabiilty although the range of permeabilities for a given series was greater than the roughness change; that is, the permeabilities had a range of about 100 per cent while the roughness didn't change more than 10 per cent. This may be attributed to the difficulty of the roughness protrusions to go deeper than one sand grain diameter under the relatively small pressure used.

Conclusions—To point out the implications of the discussions on surface roughness a simple test was tried. A base sand was selected, the permeability tested and a surface specimen rammed. This was repeated twice more, giving four specimens with 300, 200, 100, and 38 permeabilities, respectively. These specimens were then placed in a mold and the mold poured. For interpreting the results the nomenclature indicated in Fig. 8 will be used. For purposes of discussion the four specimens are designated as "A", "B", "C", "D" for the decreasing order of permeabilities.

Specimens "A" and "B" were very much alike, the latter showing slightly greater amplitude. Specimen "C" had less amplitude and the frequency was somewhat less. Specimen "D" had still less amplitude and the frequency showed a continued decrease. This last specimen had a greater amplitude than the specimen made of fine sand with corresponding permeability. These results are consistent with the theories presented and show the desirability of removing coarse grains for obtaining smooth surfaces.

The results of the tests reported herein indicate that crushed olivine differs considerably from a natural aggregate. The success of using olivine as a molding material depends largely on the size and distribution of the grains obtainable. Because the olivine must be crushed, the additional job of classification would not add much to the processing costs. Furthermore, it permits a useful method of control that is not available with natural sands.

If the grain size requirement for crushed olivine were the same as for natural sands for equivalent results, the processing cost would be larger. This is due to the characteristic manner in which olivine fractures. Under the best of conditions, the roll crushing process can produce a grain distribution about equal to that of No. 1 Ottawa after the fines are removed. On the other hand, if the grain size desired was smaller for olivine than for natural silica sands the cost of production would be reduced because cheaper methods of crushing could

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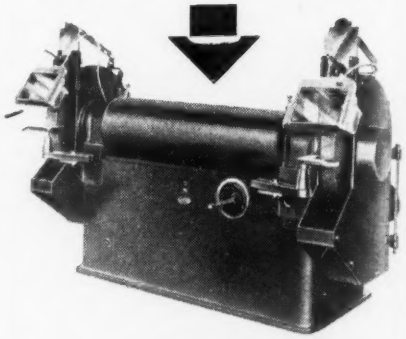

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be employed such as rod or ball mills. Furthermore, because olivine is friable the problem of maintaining a stable grain size over a period of time would be more critical if a coarse grain was needed. The finer the material that is used in the aggregate the less will be the problem of breakdown.

From all these considerations the desirability of a fine grain is apparent. The limitation as to how fine an aggregate can be used is then of paramount concern in determining the practicability of crushed olivine as a foundry molding material. This factor will be studied subsequently by special tests and by test castings.

Fine olivine is not expected to give as much trouble as is experienced with fine silica, due to its favorable expansion and fusion characteristics. Also the objection to the use of fine material from the standpoint of the development of silicosis is not encountered with olivine.

Distributes Stickers

Two color sticker stamp reminders are being distributed by Steel Founders' Society of America, 920 Midland Bldg., Cleveland 15, as a help in the national drive to alleviate the critical shortage of iron and steel scrap. Printed in red and black on white, the campaign stickers resemble postage stamps. They are being made available for use on all correspondence and literature distributed by steel casting industry representatives to customers, suppliers and many other potential sources of scrap supply in all parts of the nation.

Book Review

Industrial Wastes, by Charles H. Lipsett, cloth, 317 pages, 6 x 9 in., published by Atlas Publishing Co., New York. Price $5.

Information, presented in a manner that the layman can understand, describes how industrial scrap and waste products are produced, marketed, and prepared for reuse. Ranging over a wide field of essential wastes, the book covers plastics, chemicals, metals, textiles, rubber, paper, leather, steel, wood, glass, organic wastes, paints and solvents, agricultural wastes, and others.

Sections are devoted to copper, brass, lead, zinc, aluminum, tin, nickel, magnesium, and iron scrap.

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Melting Control Pays Off In Malleable Foundry

(*Continued from page* 101)

tioned, the iron-to-coke ratio is 10:1. Air blast is 7000 cu ft per minute. Metal from the cupolas is desulphurized in the forehearths by addition of fused soda ash. Cupolas are front slagging type and the slag from them, as well as the desulphurizing slag from the forehearths, discharges into a trough filled with running water which conveys it to a pit.

Molten metal from the cupolas is transferred to the large electric furnace in which a bath of 25 tons is maintained. Metal is tapped from the electric furnace at the rate of 18 to 20 tons per hour which means that 5 tons of metal is transferred from the cupolas every 15 to 20 minutes. From those data it can be seen that the iron is subjected to desulphurizing for a like period as that for superheating and refining.

All metal, coke and limestone are stored in bins under cover. Storage department is spanned by a 60-ft crane. Metal is picked up from the bins by a magnet suspended from the crane and discharged onto the weighing platform. The crane operator makes up his complete charge, weighing each item into the receiving hopper to complete his 6000-lb charge. The electrically operated car shown in Fig. 3 receives this charge by operating hydraulically controlled levers that drop the charge into the cupola bucket. When the bucket receives its metal charge, the operator moves it under the coke and limestone bins, and then under the hoist which elevates it up and into the cupola.

Molds are produced on three conveyor loops as shown in Fig. 6. One is a pendulum type with the mold supports suspended from an overhead rail conveyor as depicted in Fig. 4. That line, including the cooling section, is about 840 ft long and uses solid type flasks. Eight molding machines arranged in pairs serve the line. The two other molding loops are car type, as shown in Fig. 7, and are about 300 ft long. Each is served by 12 squeezer molding machines, using pop-off type aluminum flasks.

As indicated in Fig. 6, pouring loops are located near the ends of the mold loops, and the molds are filled by three pourers operating 350-lb capacity covered ladles. These are filled from a 2400-lb capacity transfer ladle conveyed on an overhead tramrail system. After being poured the molds enter hooded sections of the molding loops shown at the left in Fig. 8. Hoods are connected to an exhaust system which effectively removes the smoke, steam and other gases, keeping the foundry atmosphere clean and cool.

Molds from the lines are shaken out on well hooded vibrating grids. Sand drops onto an underground conveyor belt and is transported to an elevated storage bin. The storage bin has a capacity of 100 tons, and is located above two sand mullers with capacities each of 40 tons per hour. Sand is mulled in 1800-lb batches for 80 seconds, and discharged into boots of bucket elevators which in turn deposit the sand on belts leading to the molders' hop-

Fig. 11—In abrasive blast cleaning of soft iron the castings from the annealing ovens are elevated on apron conveyor at left to feeding hopper above continuous blasting unit in background. Cleaned castings emerge onto conveyor belt in right background for inspection and sorting

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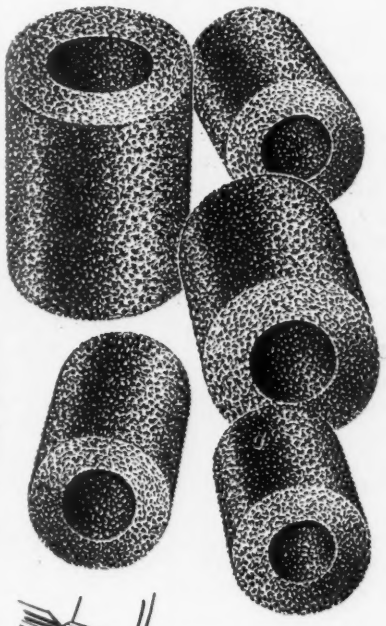

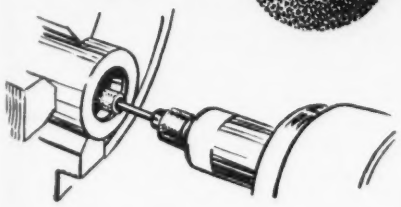

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pers, one over each molding machine.

Castings are discharged onto an apron type conveyor shown in Fig. 9 which elevates and dumps them on an elevated cross conveyor. That conveyor transports the castings to the abrasive blast cleaning department. There the castings are cleaned in a Wheelabrator automatic continuous unit at the rate of 12 tons per hour. Heat treating operations are conducted in five electrically heated furnaces. Two of the furnaces are 154 ft long, and the others are 121 ft, 118 ft, and 111 ft long, respectively. Castings are conveyed through the furnaces on roller hearth continuous moving trays. Controlled atmosphere is used in the units, and they are divided into controlled temperature zones. First zone is that of high temperature which is followed by a rapid cooling zone where the temperature of the castings is reduced to about 1440°F. From that zone the castings proceed through a slow cooling zone where the temperature is gradually decreased to 1100°F when the castings emerge from the furnace. Average heat treatment cycle is about 22 hours of which four-ninths is occupied in raising and holding the castings at high temperature, one-ninth in rapid cooling to 1440°F, and the remaining four-ninths to slow cooling through the critical range.

Castings Cleaned and Inspected

Soft iron cleaning is accomplished by the conveyor going through continuous Wheelabrator machines at the rate of 8 tons per hour. After the cleaning the castings continue on a long conveyor belt where they are sorted into the various containers ready for further processing such as gate clipping, grinding, hydraulic oil pressing and then on to final inspection and gaging (Fig. 11).

Core department is located in a 65 x 150 ft wing attached to the foundry building. Core ovens are located in a row down the center of the room, and the coremaking operations are conducted along the sides. Oven equipment consists of 12 single and one double, batch type units. Cores are placed on racks which are moved into and out of the ovens by lift trucks. Majority of the cores are produced on 15 core blowing machines, but 7 coremakers are kept busy on the bench making small cores. Core sand mixtures are compounded in a small building attached to one side of the core department, and are mixed in a 500-lb capacity mulling unit.

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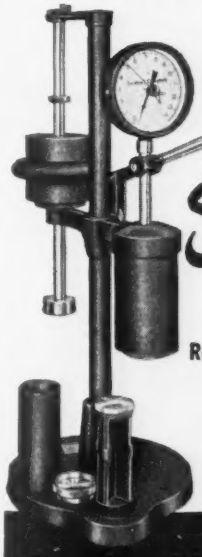

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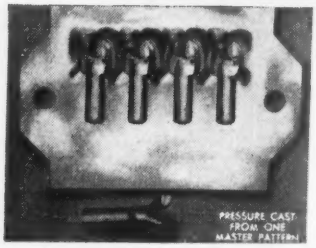

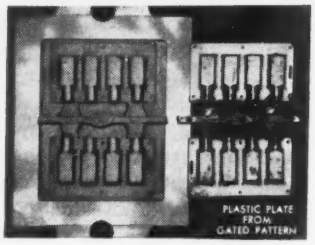

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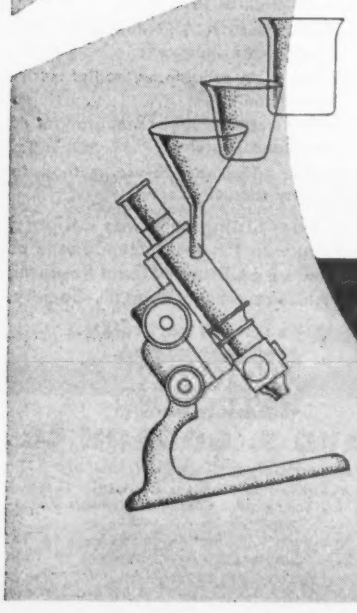

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core sand mixtures are employed. However, the bulk of the cores are produced with about four mixes in which the amount and type of core oil are varied to obtain the desired properties. For example, the main body core of a rear axle carrier is made of 400 lb lake sand, 4 lb cereal, 1½ pt core oil, and 2.5 per cent moisture. Green permeability is 20[illegible] while after baking it is 253. Tensile strength is around 100 psi, and surface hardness of the cores is 60. Slab type gate cores are made of a mix containing 400 lb lake sand, 4 lb cereal, 1½ qt core oil, and 2.5 per cent moisture. Dry permeability is 243, the tensile strength 180 psi, and surface hardness 70.

Sand mixture for front wheel hub cores is comprised of 400 lb lake sand, 4 lb cereal, 1½ pt core oil, and 2.5 per cent moisture. Tensile strength averages about 60 psi. Body cores for truck differential cases are made from 400 lb lake sand, 4 lb cereal, 1 pt core oil, and 2.5 per cent moisture, and have a tensile strength of 55 psi. Baking time of the cores varies from 45 minutes for small cores with a fast drying core oil [illegible] 1½ hours for heavy chunky c[illegible] with a slow drying oil.

Sand for the cores is a lake sand with an AFS grain fineness of about 50, and after considerable investigation the following procedure fo[illegible] compounding the sand mixture t[illegible] obtain a rapid cycle providing the desired physical properties was developed: First the dry sand and cereal are mixed together for 30 seconds. Then the moisture is added, and the ingredients mulled for 45 seconds to develop the green strength. Last the oil is added, and the mulling continued for 2 minutes.

Book Review

Modern Methods of Material Handling edited by the Material Handling Institute Inc., cloth, 248 pages, 8 x 11 inches, published by Prentice-Hall Inc., New York. Price $5.50.

To provide a broader basic knowledge for those in charge of materials handling in industry, the Material Handling Institute has gathered together numerous descriptions and photographs showing applications of all types of handling equipment. The information is presented under various industrial fields such as aircraft, automotive, beverages, building material, drugs and chemicals, electrical, food products, foundry, glass, leather, metal products oil and paint, paper produots, printing and publishing, railroads, textiles, tire and rubber, and warehousing.

Malleable Iron-Then, Now

(*Continued from page* 97)

including many highly skilled workers such as patternmakers, molders, coremakers and others. Thousands of manufacturers of finished products require and use malleable iron castings as essential component parts of their products. Thus malleables are in daily use by practically everyone in the United States. That these parts may be of high quality and produced economically, producers of malleable iron invest millions of dollars annually in improved equipment.

The earliest test results on malleable iron published in this country were those by Prof. Palmer C. Ricketts which appeared in *Van Nostrand's Engineering Journal* in 1885. Professor Ricketts' assistant in conducting these tests was Enrique Touceda, who until his death in 1943 contributed so greatly to the advancement of malleable iron. The average value of the bars then tested was 38,000 psi tensile strength and 5 per cent elongation.

Malleable iron specification standards were first established by the American Society for Testing Materials in 1904. The values then, and for subsequent years, are as follows:

	Minimum		
	Tensile Strength, psi	Yield Point, psi	Elongation, % in 2"
1906	40,000	.....	2.5
.....	38,000	.....	5.0
1917	45,000	.....	7.5
1924	50,000	.....	10.0
1927	50,000	30,000	10.0
1930	50,000	32,500	10.0
1933	*50,000	32,500	10.0
	**53,000	35,000	18.0

* Grade No. 32510. ** Grade No. 35018.

Of great significance is the fact that the test results are obtained from unmachined malleable specimens, cast in the same manner as typical malleable castings, and representative of sections in which the product is cast and used (Fig. 19). In the case of some cast materials, a ½-in. diam bar may be machined from the lower part of a 3-in. square, or larger, heavy block and its test results offered as being representative of a ½-in.-diam casting (Fig. 18). Due to solidification characteristics and other factors, the results are in no way representative of a ½-in.-diam section as cast. For malleable iron quality evaluation, a ⅝-in. diameter bar is cast, annealed and tested, without machining. It is truly representative of the toughness and ductility of a dependable material which is now in its 125th year of effective service in the United States—American malleable iron.

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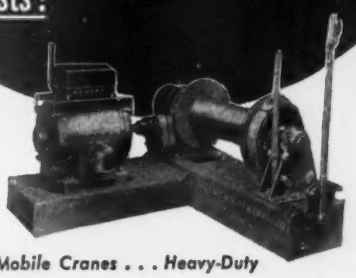

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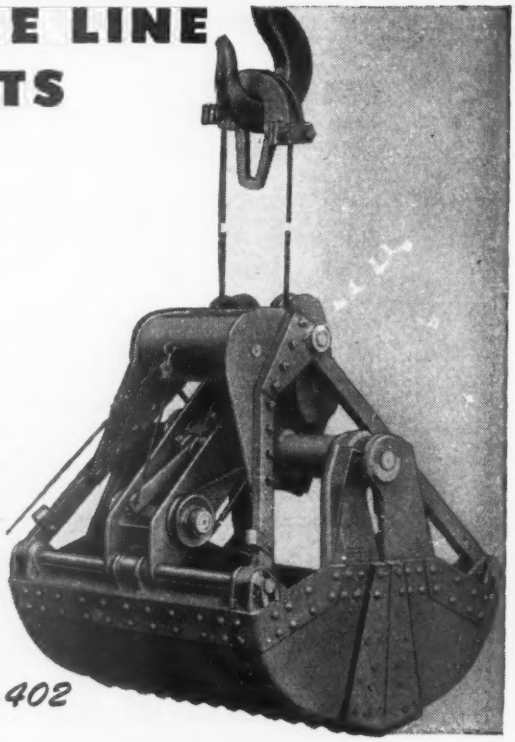

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tablish a trade association for research and development of its product. Although the exact title of the industry's organization has changed from time to time, the membership has remained essentially the same as that which now composes the Malleable Founders' Society. Indicative of the continuity is the fact that Enrique Touceda was consulting engineer of the society and its predecessor organizations from 1913 to 1943. In a similar manner, Robert E. Belt was secretary from 1917 to 1946.

First With Research Program

In co-operative work for the advancement of the quality and effective application of malleable iron, malleable producers were the first industry group to undertake a program of research with resultant benefits to users of the product. Such improvement was at once attested to by the advances in the recorded ASTM malleable specification values. In 1944, the Malleable Founders' Society produced the first complete handbook on malleable iron, *American Malleable Iron—A Handbook*. Three years later it produced the educational motion picture, "This Moving World," the story of malleable iron in sound and technicolor. Both are effectively serving their purpose in schools, colleges and industry.

One of the world's greatest inventors, Thomas Alva Edison, wrote of the inventor of malleable iron, "Seth Boyden was one of America's greatest inventors and one who never has received proper credit for his many great and practical inventions. They have been the basis of great industries which have spread over the entire world and given employment to millions of people." The fact that, in its 125th year of service, the malleable castings industry is producing at the rate of over a million tons, attests to the soundness of Edison's evaluation of Seth Boyden and the industry which he founded.

References

1. *American Malleable Iron—A Handbook* (1944), the Malleable Founders' Society, Cleveland.
2. "Malleable Cast Iron—Its Early History in the United States", George C. Davis, FOUNDRY, November, 1898.

Book Review

1950 *Supplement, ASTM Standards, Part IV, Paint, Naval Stores, Wood, Adhesives, Paper, Shipping Containers*, 340 pages 6 x 9 inches published by the American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Pa. Price $3.50.

Contains the revised standards and the new and extensively revised

tentatives relating to paint, naval stores, wood, adhesive, paper, and shipping containers, which have been accepted since the appearance of the 1949 *Book of ASTM Standards.* The 15 standards are replacements of existing standards; similarly 13 of 37 tentatives are replacements, while the remaining 24 are published for the first time. Fourteen tentatives adopted as standard in 1950 without revision and one standard with minor revisions are listed in the contents but are not published in this supplement. Yellow stickers are included for affixing to the 1949 book to call attention to standards and tentatives which have been superseded by those in this supplement, or have minor revisions, or have been withdrawn.

Suggestions on Converting To Military Production

Office of Small Business, National Production Authority, U. S. Department of Commerce, has published a pamphlet, "Converting to Military Production," listing steps for securing government prime contracts for defense items.

The pamphlet suggests that manufacturers start planning now on what lines they might convert to in the event of full mobilization. However, it advises them to continue producing present lines unless scarcity of materials makes operations unprofitable or the nation needs greater defense production. Suggestions are offered to help determine if conversion is technically practicable, and, if so, how to go about making the change.

Copies are available from Printing Services, Department of Commerce, Washington 25.

New Publication Deals With Air Purification

Air Repair, a new quarterly magazine devoted to problems of air purification, is being published by the Air Pollution and Smoke Prevention Association of America, Mellon Institute, Pittsburgh. Aim of the publication is to review the latest activities and improvements in methods, techniques and equipment, relative to air purification.

The first issue covers the association's annual convention and devotes most of its 16 pages and photographs to a report on convention papers and articles on officers elected for the coming year.

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with the SPEEDY TIPS
I'M STRONGER AND I OUTLAST THEM ALL
I WAS TOO THIN AND MY WIRES ARE BURNED OUT
For Instantly and Accurately Checking the Temperature of all Nonferrous Molten Metals
MR. METALAST
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NEW
For longer life change over to Elematic Metalast thermocouples with 11 ga. wire. Designed to outlast them all and FULLY GUARANTEED to give complete satisfaction.
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AND REMEMBER — There are still plenty available. So write today for complete description and prices.
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For 37 years the PAY OFF ingredient has been built into all Arrow tools. That is why hundreds of the leading foundries from coast to coast use them to lower their cleaning costs.

Write for Bulletin No. 101. It contains much valuable information about chipping costs.

ARROW TOOLS INC.
1900 So. Kostner Ave., Chicago 23, Ill.

...TRADE PUBLICATIONS...

For More Details on these Items Use Reply Card—Page 235

ATOMIC DEFENSE: Walter Kidde & Co., Dept. A, 675 Main St., Belleville 9, N. J.—Booklet, "How To Prepare Your Plant for Atomic Attack," presents factual information about the atomic bomb, its destructive potential and its limitations; a guide to plant management in organizing personnel to cope with possible plant disasters; and recommendations for strengthening plant construction and sustaining production in the face of bomb attack.
For More Details Circle No. 90—Page 235

OIL HEATERS: Hauck Mfg. Co., 124-136 Tenth St., Brooklyn 15—Catalog 709 covers electric oil heaters with automatic control of oil temperature for heating heavy grades of fuel oil and maintaining it at proper pumping temperature. The preheater then heats the oil from pumping temperature to the higher temperature usually required at the burner for atomization and combustion of oil.
For More Details Circle No. 91—Page 235

BLAST CLEANING: Pangborn Corp., 1400 Pangborn Blvd., Hagerstown, Md.—Bulletin 219 describes a turn-style table for airless blast cleaning of castings by centrifugally throwing abrasive particles against part being cleaned from vanes of high-speed rotating wheels. Details of operation are given, as well as protective features, crane loading possibilities and engineering specifications.
For More Details Circle No. 92—Page 235

LIGHTING: Westinghouse Electric Corp., Box 2099, Pittsburgh 30—Booklet B-4727 stresses important benefits resulting from proper industrial lighting. It analyzes the three modern light sources (fluorescent, mercury vapor, incandescent) as to type of light, efficiency, lamp life, maintenance, mounting height and job suitability. Special lighting for special areas is illustrated.
For More Details Circle No. 93—Page 235

MAGNETIC SEPARATORS: Eriez Mfg. Co., Erie, Pa.—Catalog 15 describes permanent magnetic separators for tramp iron removal. Engineering data, photographs, drawings, tabular specifications, information on the selection of the appropriate magnetic separator, explanation of the life of permanent magnets, and the importance of application engineering are included.
For More Details Circle No. 94—Page 235

BATTERY DATA: Gould-National Batteries Inc., 467 Calhoun St., Trenton 7, N. J.—Handbook contains technical instructions and engineering data on care of motive-power storage batteries. Sections include information on care and operation, maintenance and repairs, parts, and technical data. Section on battery charging gives information on modified constant voltage and two rate charging, automatic and manual control of charging, and charging equipment maintenance.
For More Details Circle No. 95—Page 235

LOADER: Lull Mfg. Co., 3612 East 44th St., Minneapolis 6—Illustrated folder describes an improved loader for digging, lifting, loading, transporting, scraping or bulldozing. Schematic drawings show advantages of the company's loader. Six models are available, and the folder rates them by lifting capacities, dumping heights, and forward reach.
For More Details Circle No. 96—Page 235

CORE OIL: Archer-Daniels-Midland Co., Foundry Products Division, 2191 West 110th St., Cleveland 2—Bulletin 108 describes an improved chemically modified core oil developed in the company's foundry research laboratory. Details are given on shipping, storage, mixing, workability, collapsibility, baking, and green strength.
For More Details Circle No. 97—Page 235

VENTILATORS: Burt Mfg. Co., Dept. F, 927 South High St., Akron 11, O.—Catalog gives design and construction features for each type of company ventilator plus mounting and flashing details, performance, dimension, and weight data. Basic information on dampers, bases, industrial louvers, and general purpose louvers also is included.
For More Details Circle No. 98—Page 235

FLOOR REPAIR: Stonhard Co., 525 Stonhard Bldg., 1306 Spring Garden St., Philadelphia 23 — Pocket-size booklet analyzes flooring problems. It tells where to look for and how to correct bad floor conditions, how to protect concrete and wood floorings and maintain proper repair by comparatively unskilled workmen.
For More Details Circle No. 99—Page 235

METAL FINISH: Mitchell-Bradford Chemical Co., 2446 Main St., Stratford, Conn.—Illustrated folder describes black oxide process for steel and iron. Blackening salt solution produces attractive black finish, has corrosion resistance and inhibits build-up of red iron oxide and counteracts contaminants in the solution.
For More Details Circle No. 100—Page 235

INSTRUMENTS: Minneapolis-Honeywell Regulator Co., Brown Instruments Division, Wayne & Windrim Aves., Philadelphia 44—The following data sheets are offered: 415-1 covers air operated diaphragm motor valves for use with narrow throttling band or on-off instruments; 10.0-6 covers comparison measurement of two independent variables; 6.2-2 covers portable immersion thermocouple for ferrous foundry ladles; and 175 covers

electronic strip chart potentiometer controller.

For More Details Circle No. 101—Page 235

HEAT PROCESSING: Selas Corp. of America, Erie Ave. & D St., Philadelphia 34—Bulletin highlights the importance of heat processing machines as automatically controlled precision tools in production lines. Descriptions and illustrations include metal brazing, selective hardening, melting and normalizing.

For More Details Circle No. 102—Page 235

ELECTRICAL FITTINGS: Buchanan Electrical Products Corp., 1290 Central Ave., Hillside, N. J.—Illustrated catalog 1050 describes manufacturer's line of solderless wire connectors, cable and conduit fittings and wiring devices. It includes specifications, dimensional data, application instructions and ordering information.

For More Details Circle No. 103—Page 235

VOLTMETERS: Bristol Co., Waterbury 20, Conn.—Bulletin E1111 covers features of recording voltmeters and ammeters with special emphasis on the newly developed moving-iron measuring mechanism. Information is given on ranges, uses and specifications of the various models for permanent installation and portable use.

For More Details Circle No. 104—Page 235

BELT GRINDING: Carborundum Co., Niagara Falls, N. Y.—Folder describes new type serrated rubber contact wheel for abrasive belt back stand applications. Wheel is said to cause a controlled breakdown in the bond of abrasive belts and to eliminate glazing, resulting in increased belt life and cutting rate.

For More Details Circle No. 105—Page 235

TRUCK ATTACHMENTS: Towmotor Corp., 1226 East 152nd St., Cleveland 10—Folder illustrates fork lift truck attachment devices specially designed to grip, clamp, grab or support almost any type of load, and lift, transport, unload, deposit, dump, upend or completely revolve it.

For More Details Circle No. 106—Page 235

OIL PURIFICATION: Honan-Crane Corp., 656 Wabash Ave., Lebanon, Ind.—Booklet provides information on oil purification for hydraulic equipment, metalworking machines, gas and diesel engines, turbines, transformers and other equipment.

For More Details Circle No. 107—Page 235

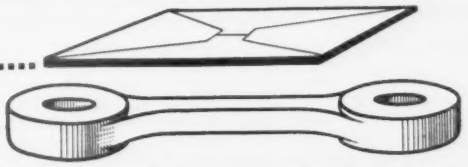
GLOVES: American Rubberizing Co., 617 Eleventh Ave. So., Minneapolis 4—Bulletin describes processing of canvas and cotton knit gloves with natural rubber, Neoprene, or plastic. Styles, sizes, colors, and applications are outlined.

For More Details Circle No. 108—Page 235

PYROMETERS: Wheelco Instruments Co., 847 West Harrison St., Chicago 7—Bulletin PPY-1 covers two portable pyrometers suitable for plant and laboratory. They are used for measuring temperatures of molten nonferrous metals.

For More Details Circle No. 109—Page 235

Gamma rays.....
unexposed film.....
steel casting.....



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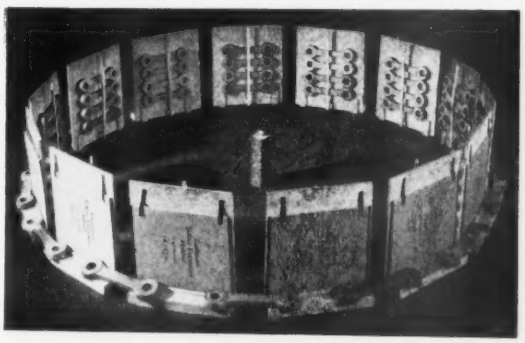
improves foundry practice and production

Compared with X-ray radiography, radium radiography is new, but its peculiar advantages have been finding increasing favor with steel foundries. The first commercial radiograph with radium was made in 1930—and by 1950 250 steel foundries throughout the country were using radium radiography. The constant activity of radium, the even dispersion of its rays with a minimum of scattering; the portability of the equipment and simplicity of operation all combine to make radium radiography an economical, non-destructive method of testing. Write today for case histories and additional information. *Your requirements promptly supplied.*

Illustration shows 60 steel castings being photographed simultaneously. The gamma rays, flying in all directions, go through all the castings at once, making 60 exposures of the 60 castings



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at PRODUCTION LINE SPEEDS

Simply set tolerance hands on the lower dial of this Brinell Hardness Tester to the desired limits and the operator merely notes that the indicator points stop within them.

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CORE BLOWING EQUIPMENT, METAL CORE BOXES, DRIERS AND METAL MATCH PLATES

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It is the fourth such product I have used and is far superior to the first three. Overnight cleaning on driers which had not responded to two days' soaking in another product is evidence of the efficiency of your cleaner.
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ROUND GRAIN SILICA SANDS
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FINE MESH SANDS FOR LIGHT METAL CASTINGS
SILICA FLOUR . . . COARSE BLASTING SAND

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Mines and Mills in the Ottawa-Wedron District

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INSPECTION EQUIPMENT: Arthur S. LaPine & Co., 121 West Hubbard St., Chicago 10 — Catalog covers steroscopic microscopes and accessories, magnifier lights, black lights, microlights, fluorescent illuminator, inspection lamps, and pocket and desk magnifiers.

For More Details Circle No. 110—Page 235

HYDRAULIC EQUIPMENT: Logansport Machine Co., Logansport, Ind.—Booklet presents concise information on setting up and servicing air and hydraulic equipment. It is of value to tool engineers, designers and maintenance men.

For More Details Circle No. 111—Page 235

CHAIN DRIVES: Chain Belt Co., 1600 West Bruce St., Department PR, Milwaukee 4—Bulletin 51-7 entitled "Installation, Operation and Maintemance of Chain Drives and Conveyors," shows how to get the most service from sprocket chains.

For More Details Circle No. 112—Page 235

FITTINGS MACHINES: Cleveland Tapping Machine Co., Canton 6, O.—Bulletin F-100 illustrates various details of newly designed fittings machines. General specifications of two models and descriptions of typical assemblies are given.

For More Details Circle No. 113—Page 235

X-RAY: Picker X-Ray Corp., 300 Fourth Ave., New York 10—Bulletin 21250 portrays x-ray machines and equipment and contains discussion on various makes and types of film for industrial use.

For More Details Circle No. 114—Page 235

CRANE: Orton Crane & Shovel Co., 608 South Dearborn St., Chicago 5—Bulletin 82 describes the application of a torque converter combined with fluid clutch to a locomotive crane.

For More Details Circle No. 115—Page 235

IMPREGNATING PROCESS: Metallizing Co. of America, 3520 West Carroll Ave., Chicago 24—Bulletin explains equipment used in impregnating process, claimed to eliminate casting porosity.

For More Details Circle No. 116—Page 235

BELT MAINTENANCE: Cling-Surface Co., 1048 Niagara Ave., Buffalo—Poster charts use schematic pictures and copy to describe steps in the care, maintenance and treatment of all power-driven belts.

For More Details Circle No. 117—Page 235

REFRACTORIES: Ironton Fire Brick Co., Ironton, O.—Bulletin 101 describes and pictures machine-made cupola blocks of Kentucky flint and semiflint clay, together with other refractory specialties.

For More Details Circle No. 118—Page 235

HUMIDITY CONTROL: Surface Combustion Corp., Toledo 1, O.—Bulletin K-151 describes humidity control systems for producing and maintaining product processing conditions with temperatures as low as —60°F.

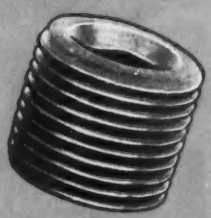
For More Details Circle No. 119—Page 235

when you need CORE BOX PROTECTION ...it's MARTIN

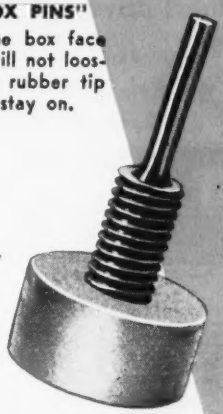
"PROTEXABOX PINS"
Cannot mar the box face because they will not loosen. Protective rubber tip guaranteed to stay on.

"SAND ARRESTER TUBE"
Save cores and step up production. Guaranteed for 100,000 blows.

Every Martin product is designed especially for "core box protection"—each is built to prevent a specific type of wear on your core boxes. They are engineered by foundry men to assure easy installation, successful operation. Martin products add years to the life of your equipment by enabling you to salvage old plates and core boxes, by preventing abrasion, and giving your plywood blow plates the lasting qualities of steel. Each product carries a guarantee of absolute satisfaction. Martin products are manufactured under United States and foreign patents and distributed all over the world by foundry supply houses.



"HOLINER" BUSHINGS
Stop abrasion between blow plate and core box. Protect blow holes.



"STRIPINSERT"
Protects parting line—easily installed in old or new boxes. Cutters for groove available at moderate cost.

"PULLINSERT" BLOW BUTTONS
Positively stop sand blasting under blow holes. Available in nine popular sizes.

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The powerful all-directional vibration of the Peterson Vibrolator makes this an ideal unit for keeping materials flowing in chutes or hoppers. The Vibrolator will not crack attaching lugs on match plates or core boxes. Instantly self starting and virtually noiseless in operation, this new type vibrator eliminates maintenance worries and gives a long, dependable service life. No lubrication is necessary. The Vibrolator is light in weight to lessen fatigue and permit maximum delivery of vibration. There are five sizes available to meet all your foundry requirements. Peterson Vibrolators are sold only by Martin, exclusive manufacturers of ball-type vibrators.

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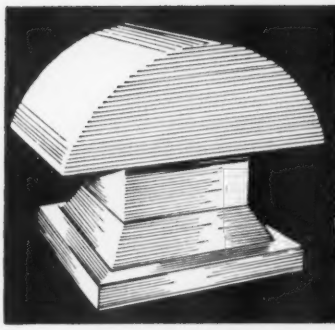

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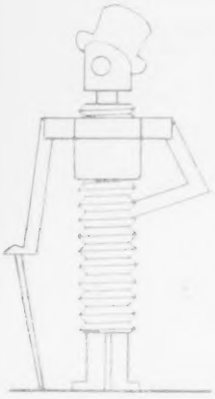

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If you need to perform any or all of these operations: Tapping . . . Threading . . . Drilling . . . Spot-facing . . . Reaming . . . Chamfering. Cleveland engineers can help you with your problem, show you how to effect economies in these operations.

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Quality belting is economical belting. Dandux foundry belts for elevating and conveying are your best belt buy . . .

more FLEXIBLE
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DANDUX STANDARD NO. 60-10 gives unusually long and superior service with oily core sand and cold sand.

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Dandux belts are designed with the installation in mind.

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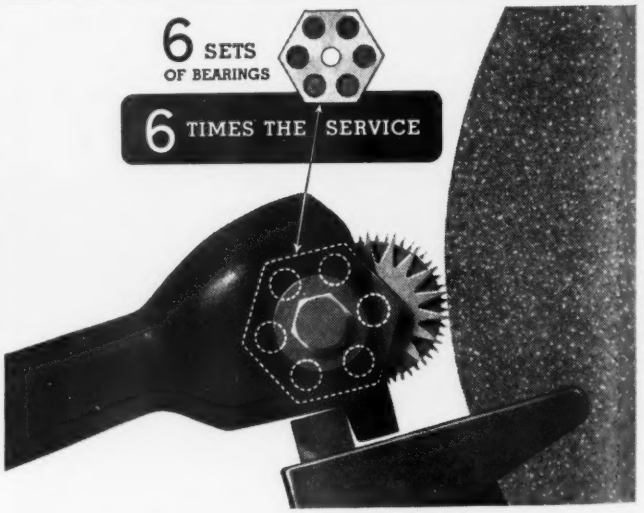

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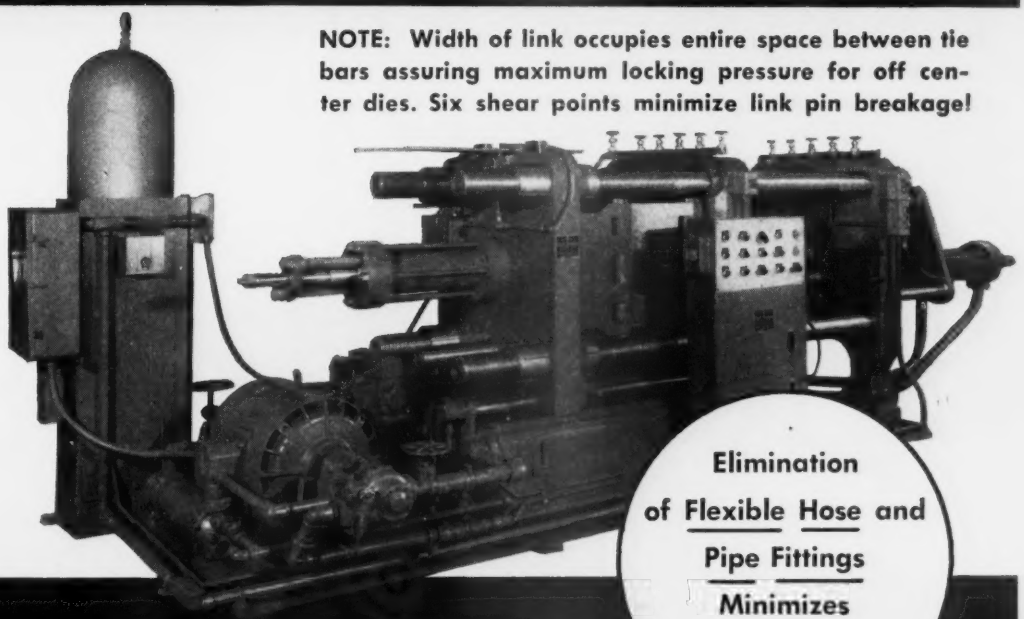
CAST-MASTER *Die Casting Machines*

Precision-Built By Die Casting Engineers!

• Cast-Master Die Casting Machines are designed and built by engineers with years of experience in the Die Casting Industry. Each model has been given months of actual operation under the most severe conditions. You'll find a CAST-MASTER geared for years of trouble-free operation plus high speed production at a minimum cost.

NOTE: Width of link occupies entire space between tie bars assuring maximum locking pressure for off center dies. Six shear points minimize link pin breakage!



Elimination of Flexible Hose and Pipe Fittings Minimizes Fire Hazards!

MILLER•TAYLOR TOOL CO.
5005 EUCLID AVENUE • CLEVELAND 3, OHIO

COLOR YOUR CORE SANDS

Modern foundries have found it practical to color their various grades of core sands. This eliminates guesswork and assures the proper use of the required type of core sand for the particular job at hand.

Our laboratories have developed a line of special dyes in a range of colors that have been carefully tested and found suitable as well as economical.

Write us for details and samples.

EATON CHEMICAL AND DYESTUFF COMPANY

1490 Franklin Street — Established in the year 1838 — Detroit 7, Michigan

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Master Power
HARD CHROMED • PORTABLE PNEUMATIC TOOLS

DO MORE WORK AT LESS COST
because they deliver more power per cubic foot of air consumed, are light in weight for easier maneuverability and they retain their new tool power longer.

ARE PREFERRED BY OPERATORS
because they are lighter in weight, better balanced and designed to reduce shock and be free from vibration.

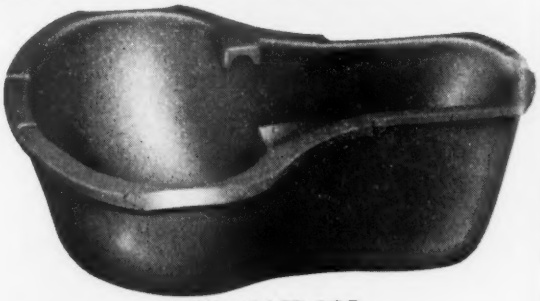
IF YOUR PROBLEM INCLUDES
chipping, ramming, grinding, buffing, sanding or wire brushing, *write us today for full particulars.*

THE MASTER PNEUMATIC TOOL COMPANY, INC.
ORWELL, OHIO • U. S. A.
SALES ★ SERVICE ★ STOCK ★ COAST TO COAST

MELTING POTS—Ingot Molds

FOR NONFERROUS METALS FROM ACME SPECIAL FORMULA

SPOUT POT
NO. 550A



DIE CAST POT

HOLDING BOWL
NO. HP7001

WRITE FOR
SCHEDULE OF 40 SIZES

ACME FOUNDRY COMPANY

2502 22nd Street **DETROIT 16, MICH.** *Phone:* Tashmoo 5-2404

"Oliver" Pattern Lathes

No. 22 Lathe is versatile and powerful!

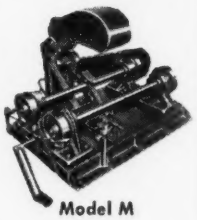
It handles big jobs with ease. Above, it is shaping a large pattern for a locomotive wheel. Movable carriage and tail stock enable this Lathe to handle a wide range of work. This is one of a large line of pattern lathes used by leading engineering works. Tell our engineers of your needs.

OLIVER MACHINERY CO., Grand Rapids 2, Mich.

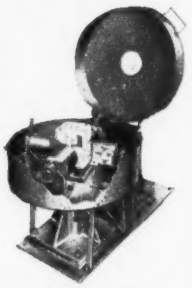
CENTRIFUGAL CASTING MACHINES

Model AS

Model J



Model M



Model J-P

These machines used to make ferrous and non-ferrous centrifugal castings are produced by the pioneer manufacturer of such equipment.

They are made in a large variety of styles and a wide range of sizes. Complete technical information is supplied concerning sand and permanent mold design, gating, sand mixes, speeds, etc.

Send us drawings or sketches of parts you are interested in casting centrifugally, and we will tell you, without obligation, if and how our machines can cast them faster, cleaner and with fewer rejects.

CENTRIFUGAL CASTING MACHINE COMPANY
Nathan Janco, *President*
P. O. Box 947 Tulsa 1, Okla.

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WATERLOX

TRANSPARENT CASTING SEALER

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It Saves Time!
It Saves Money!
It Saves Labor!

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THE EMPIRE VARNISH COMPANY
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Use *Self-Dumping* Containers

MORE
Material Handling
50% Less Time

WITH

ROURA *Self-Dumping* HOPPERS
—they pay for themselves

Only ROURA Has the Exclusive (PATENTED) Instant Release Handle

Handling wet or dry, hot or cold, bulky materials quickly and easily, the ROURA is simple to operate—only one man is required for distributing and unloading—and he does this in much less time than ordinarily required under old-fashioned manual methods. Thousands of Roura Hoppers (which fit any standard fork or platform lift truck) are in constant daily operation, serving and saving for such firms as Owens-Illinois Glass, Corning Glass, National Fireproofing, General Motors, Ford, Chrysler, American Brake Shoe, General Electric, Westinghouse, Western Electric, American Steel Foundries, International Harvester, John Deere, etc.

By a simple lift of the exclusive release handle, the ROURA HOPPER dumps, rights and locks itself securely. Sizes—½, ¾, 1, 1½ and 2 cubic yards; the ROURA HOPPER can also be designed for flat trucks and in other sizes to meet specifications. Also, it can be equipped with special flanges that permit stacking to desired tiers for storage or future distribution of materials—conserving valuable floor space. Priced below all competition, the ROURA will quickly pay for itself many times over.

—Can Be Coated With Acid-Resistant Paints
Write today for detailed brochure, "In Dollars & Sense."

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Reduce Use of Chills in Gray Iron Casting

Now all you have to do to get hard chilled iron is add

TELLURIUM

Comes in 1, 2, 3, and 4-gram tablets; also in powder, slabs and sticks. For full information, write Dept. LM for 16-page article on the use of TELLURIUM in chill control.

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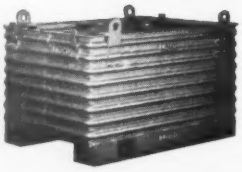
Here's why

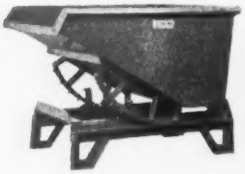
rugged BRUSCO handling equipment increases foundry efficiency

BRUSCO CORRUGATED STEEL BOXES



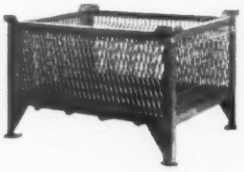
Save floor space — stack safely from floor to roof. Four way entry for fast, efficient handling. Equipped with crane lugs for movement by crane. Fabricated from heavy gauge corrugated steel to give added rigidity and maximum strength. Thoroughly and securely arc welded for longer, maintenance free life. Made in various sizes and load capacities to suit your requirements.

BRUSCO SELF-DUMPING HOPPER



Speeds production and saves labor in handling parts and materials in your foundry. Easy to move and simple to operate. Hopper is fabricated of heavy steel plate thoroughly reinforced. This unit is equipped with a new, cast steel rocker and hardened pins for longer service. Made in ½, 1, 1½ and 2 cubic yard capacities. Underclearance optional.

BRUSCO CASTING COOLING BOXES



Shortens cooling time. Stacks quickly, safely and saves vital floor space. Made in sizes and load capacities to fit your particular requirements.

These are only a few of the *Standard* items in the complete BRUSCO material handling line for foundries. These and the many other BRUSCO units can be built to meet your specific needs. Remember, every BRUSCO material handling unit is built to speed, simplify and ease your Foundry materials handling. Write today for full information.

Brusco HANDLING EQUIPMENT

BRUMMELER STEEL PRODUCTS CORPORATION

1412 Ionia Ave., S. W. Grand Rapids, Michigan

No. 4 DAYTON RING VALVE BENCH RAMMER

MORE POWER—MORE SPEED

You'll get more production with these faster, more powerful rammers and at the same time substantially reduce maintenance costs.

The Valve Units will last for years. The Cylinder Bores and Piston Rods are HARD CHROME PLATED which doubles the life of the Rammer. Many of the largest foundries in the country have already adopted them as standard. Made in six sizes to meet every requirement.

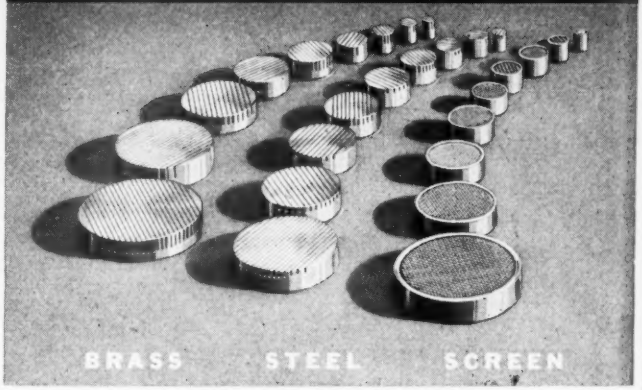
Send for Bulletin 300

DAYTON PNEUMATIC TOOL CO.

Manufacturers of Pneumatic Tools Since 1903

DAYTON, OHIO

PRECISION CORE BOX VENTS



You can depend on the quality that is built into every Demmler Core Box Vent. All orders are promptly filled from stock.

SLOTTED VENTS
(Available in Brass or Steel)
Slot Widths: .010", .013", .015"
Diameters: 1/8", 3/16", 1/4", 5/16", 3/8", 7/16", 1/2", 5/8", 3/4", 7/8" 1", 1 1/4", 1 1/2"

STAINLESS STEEL SCREEN VENTS
Mesh: #30, #40, #50
Diameters: 3/16", 1/4", 5/16", 3/8", 7/16", 1/2", 5/8", 3/4", 7/8", 1", 1 1/4", 1 1/2"

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A FERGUSON FOUNDRY FIRST TEAM FOR YOUR OPERATION

Our technical Foundry men, qualified by years of experience in this field, will survey your present facilities and advise you on methods for lowering costs and increasing production.

Ferguson's recommendation may include a new plant, or more efficient use of existing facilities. It may mean improved methods or modern machinery; it could result in higher production without costly investments in space, equipment or personnel.

Whatever your requirements, a Ferguson Foundry First Team will make a practical analysis of your problems. Preliminary discussions in confidence and without obligation.

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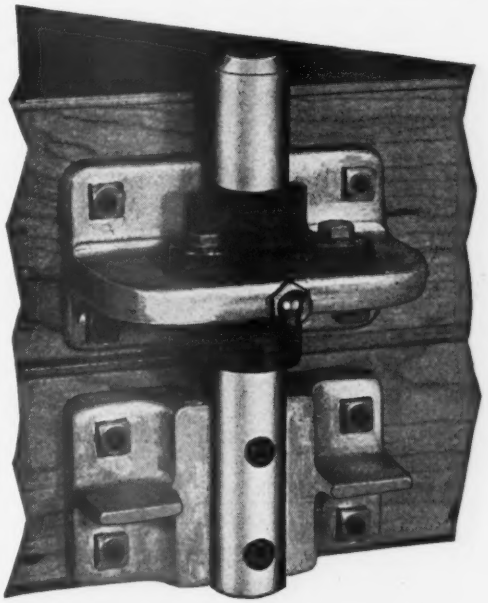
V-G CHERRY SNAP FLASKS

Featuring the

V-G ROUND PIN ASSEMBLY



ONE INCH ROUND STEEL PIN HARDENED and RUSTPROOF DOUBLE LIFE—REVERSIBLE

REMOVE CAP SCREWS AND ROTATE PIN 180 DEGREES.

ALUMINUM PIN BASE AND COPE EAR ADJUSTING SCREW FOR COPE GUIDE

V-G Flasks are seasoned cherry with new hook-type latches that never loosen. Adjustable hinges are screwed AND bolted to the flask. Wear strips of either steel or HARDENED-24ST- Aluminum are available. Other standard pins also available.

Shipments can be made promptly

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Correspondence invited from Distributors

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Produced from the famous White St. Peter Sandstone Deposit

Foundries from coast-to-coast are using CLAYTON SILICA SAND. Our special processing, large production capacity and unlimited supply of raw material enable us to give prompt, year 'round shipment of uniform foundry sand.

Perfect Uniformity . . . Eight standard grades available. Featuring grades up to 100 grain fineness—all screened, dried and uniformly graded by our EXCLUSIVE AIR-WASH PROCESS. Four Screen Sands.

Chemical analysis, sintering tests, and screen analysis available upon request. Wire, write or phone for full details.

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PLANT LOCATION: Clayton, Iowa

AUTOMATIC • HEAVY DUTY

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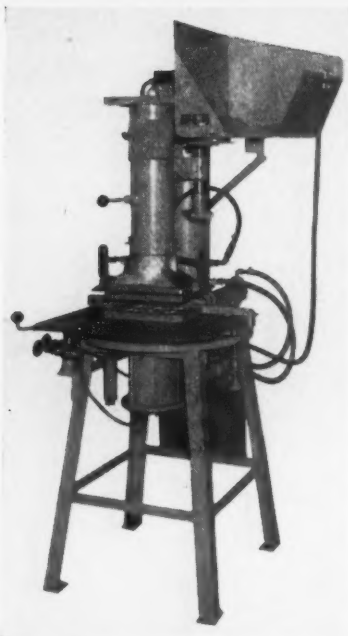

HIGH DRAW

MODEL "C-H-E"

Cores up to 15 lbs.

With the operation of one lever on the hand machine, or pushing of one button on the electric cycle, this machine will —Close the Core Box—Blow the Cores—Vibrate the Box—Draw the Cores—and Eject the Core Box to position where the dryer is applied. Produces more cores with less operator fatigue, and more cores per hour.

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Let us figure on your requirements.

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SHORT CUT TO PROFITS

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For low cost cleaning

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- AMASTEEL assures the lowest cleaning cost.
- AMASTEEL lasts many times longer. Investigate!
- AMASTEEL provides peak efficiency in shot for blast cleaning and peening. Developed by the maker of "PEENBLAST", "CLEANBLAST" and "ALLOY 99".

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MILWAUKEE-TESSMER
Sprue Cutter
for
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- Cuts Sprues and Gates with One, Swift, Sure Stroke.
- Does away with tedious hand labor.
- Speeds flow of work through cleaning department.
- Built for years of Rugged, Low-Cost Service.
- 2 Sizes, ¾" and 1¼" square. Built-in electric motor or belt drive.

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JISCO

A "blend" with JISCO is sound metallurgy.

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ALL GRADES OF WASHED, DRIED, SCREENED

SILICA FOUNDRY SANDS

Produced from the celebrated Ottawa District St. Peter Sandstone

Steel Molding Sand • Core Sand • Blast Sand • Furnace Bottom Sand
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Sands for Croning "shell" process, and for precision castings.
MICROSIL Ground Silica (5 Standard Grades of pure white Silica Flour)

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Patterns come clean from the sand to make a perfect mold when they're coated with CO-LOIDAL-AC Lacquer.

This hard, long-lasting finish is being used by more and more foundries as its advantages are discovered. Place a trial order today and see the improvement.

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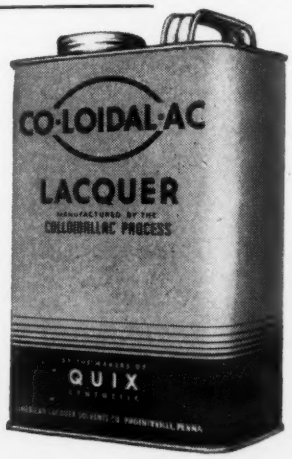

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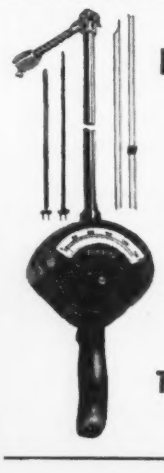
Accurately . . . at a glance!

Use the Simplified PYRO Optical Pyrometer

Any operator can quickly determine temperatures of minute spots, fast-moving objects and smallest streams with the simplified PYRO Optical Pyrometer. Completely self-contained—no calibration charts or accessories needed. An accurate, DIRECT-READING instrument that will pay for itself many times over by helping prevent spoilage. Weighs just 3 lbs. Available in 5 ranges (1400° to 7500° F.) *Write for FREE CATALOG #80, today!*



For Non-Ferrous Foundries . . . the PYRO IMMERSION PYROMETER

Helps insure low-cost production of SOUND, UNIFORM Castings. Has shielded steel housing which is shock-proof, dust-proof and moisture-proof—withstands roughest handling. "Protected Type" and "Bare Metal" thermocouples are instantly interchangeable, without adjustment or recalibration. Large 4-inch easy-reading dial. Equipped with exclusive LOCK SWIVEL. Available in 6 ranges (1000°F to 2500°F). *Write for FREE Catalog #150*

THE PYROMETER INSTRUMENT CO.
New Plant & Lab.
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The *same* "Shark Tooth" Bucket handles sand without leakage and coke with minimum degradation

THIS dual purpose Single-Line Hook-On Bucket saves money two ways—the *same* bucket handles both coke and granular fines (sand, coal or small limestone) simply by attaching or taking off the liner plates . . . you're sure of minimum coke degradation or no sand leakage. Available for different headroom conditions. Write for Form 2265 for other money-saving advantages.

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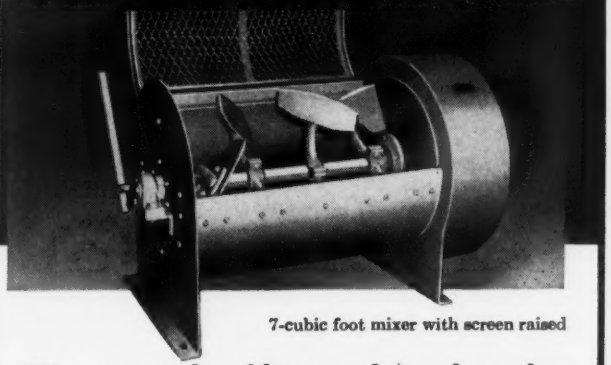
BLAW-KNOX FOUNDRY BUCKETS

FASTER, BETTER MIXING Lowers Your Operating Cost



7-cubic foot mixer with screen raised

Mix core and molding sands, and cupola patch mixes with MULTI-BLADE MIXERS

- THEY'RE FAST . . . mix and discharge a load in four and a half minutes.
- THEY MIX BETTER . . . the best blade arrangement in any mixer . . . cuts, turns and kneads the mix ten times with every shaft revolution.
- THEY'RE QUALITY BUILT . . . trouble free, self-contained, have anti-friction bearings, direct drive (no clutch or belts), and come in sizes from 3 to 60 cu. ft. capacities. Special and larger mixers also available.

Get these advantages and resultant savings. See your foundry equipment dealer or write direct to

MULTIPLEX MACHINERY CORP. ELMORE OHIO

HAYNES EQUIPMENT
JOLT SQUEEZER

This portable jolt squeezer is furnished in two sizes: 10" squeeze cylinder with 3" jolt cylinder and 12" squeeze cylinder with 4" jolt cylinder. Jolt tables 17" x 20" and 19" x 22".

The post and squeeze cylinder are cast in one piece. Top of post machined to take 2-7/16" cold rolled shaft for the swing arm. Zerk fittings throughout.

No bolts or screws in this machine!

FULLY EQUIPPED

Equipped with air gauge, pop-off gauge and pin for gate horn.

The price will interest you!

HAYNES FOUNDRY EQUIPMENT CO.
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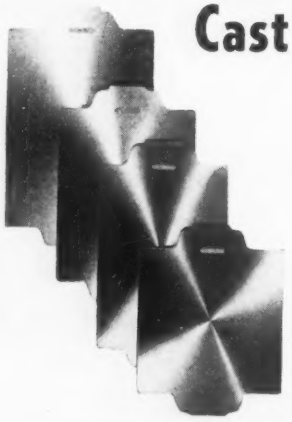
LADLES—BRASS FURNACES—CORE OVENS



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Shipped promptly from the World's Largest Stock

All standard flask sizes are carried in stock. All plates are cast with one inch flask margin all around PLUS large, well shaped ears for flask pins and vibrator. Order by flask size, not plate size. It will pay you to investigate this source for quality plates.

Some Typical Prices for ⅜" Plates . . . Add 33 1/3% For ½"

10 x 16 . . . 9.90	11 x 18 . . . 11.22	12 x 18 . . . 11.88	14 x 16 . . . 12.18
10 x 18 . . . 10.56	12 x 14 . . . 10.26	13 x 16 . . . 11.58	14 x 18 . . . 14.52
11 x 16 . . . 10.26	12 x 16 . . . 10.86	14 x 14 . . . 11.22	16 x 16 . . . 14.52

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Roller Bearing throughout
Direct Motor Drive with Speed Reducer
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No. 4-A
Self Dumping

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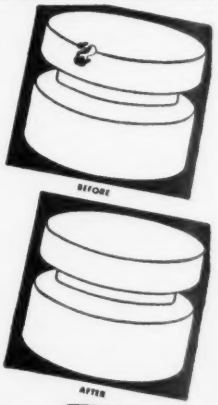
WRITE TODAY FOR NEW BULLETIN DIMENSION SHEET AND PRICE LIST

PENN IRON WORKS, INC.
READING, PENNA.

For Surface Blemishes in ALUMINUM CASTINGS



Have you used the Smooth-On Foundry Cement made especially to correct blow holes, porous and rough spots, dents and other unsightly but harmless surface defects in otherwise sound *aluminum* alloy castings?

Applied like the widely used Smooth-On *Iron* Foundry Cement, Smooth-On No. 8 *Aluminum* Cement fills in evenly, hardens quickly, matches perfectly. Stays in place, too, for it expands slightly as it sets.

Smooth-On No. 8 Aluminum Cement comes in 1- and 5-lb. sizes. 1 lb. will fill 17 cu. in. Order it by NAME AND NUMBER from your supply house. If they haven't it, write us. If you have not yet discovered Smooth-On No. 8, ask us for

FREE SAMPLE TO TEST

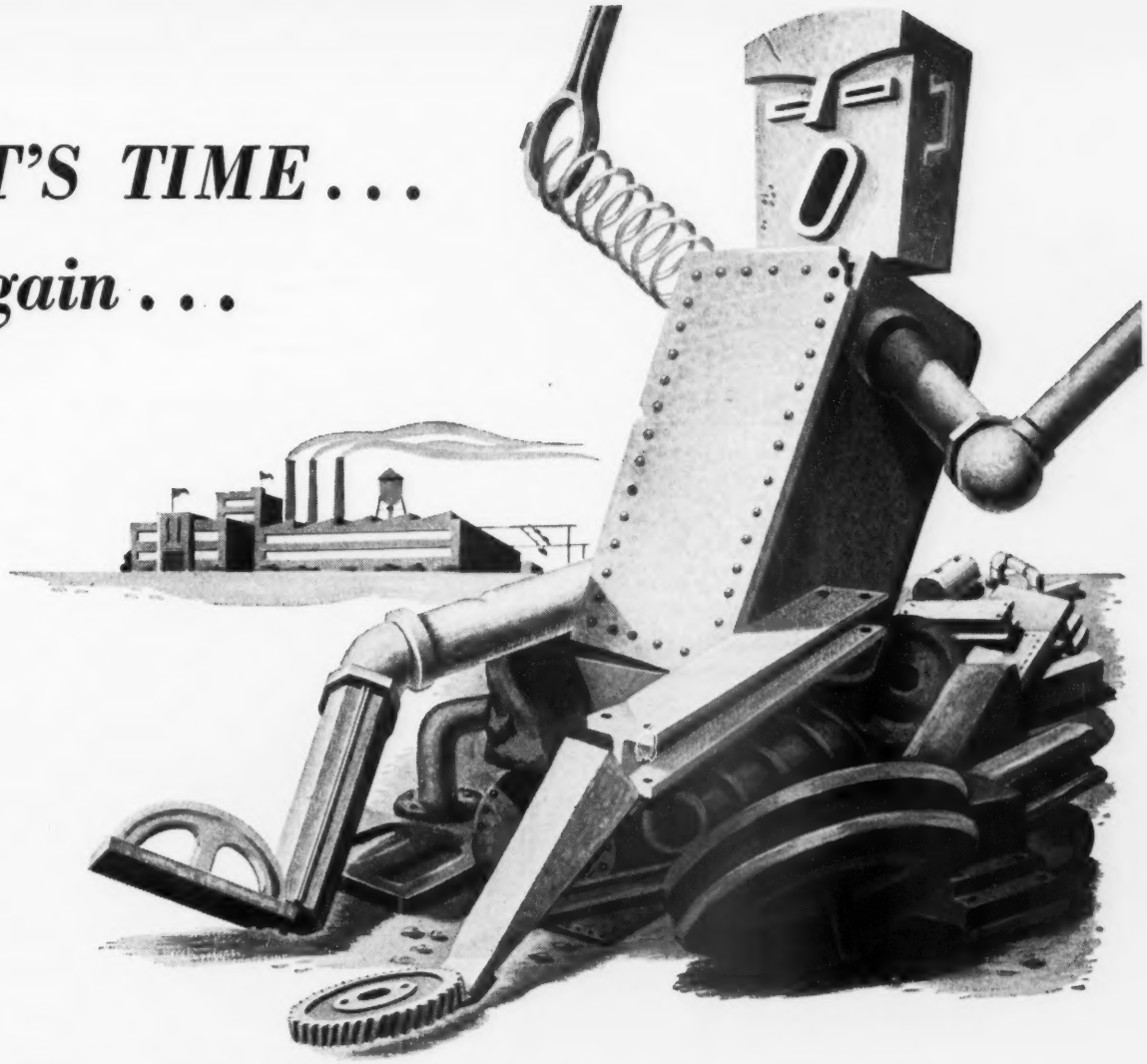
You'll receive also the famous 40-page SMOOTH-ON HANDBOOK, filled with industrial uses for the various Smooth-On Cements. 170 illustrations. Write today.

SMOOTH-ON MFG. CO., Dept. 17
570 Communipaw Ave., Jersey City 4, N. J.

***Do it with* SMOOTH-ON**
No. 8 ALUMINUM CEMENT

IT'S TIME . . .

again . . .



TO WAKE UP SCRAPPY!

Scrap's getting scarce again . . . compared to the amounts we need . . . and it's up to *all* of us to *help* produce enough steel.

107,000,000 tons of steel is the present rate of production in 1951 . . . 119,500,000 tons is expected in 1952.

Last year, 1950, we produced 97,800,000 tons.

All that extra steel—enough to take care of *both* military and civilian needs—calls for *more scrap iron and steel.*

Scrap Inventories Are Alarmingly Low

While steel mills are producing at a greater rate than ever, scrap inventories have dwindled. Many mills are operating on a hand-to-mouth basis with shut-downs threatened unless we furnish more scrap.

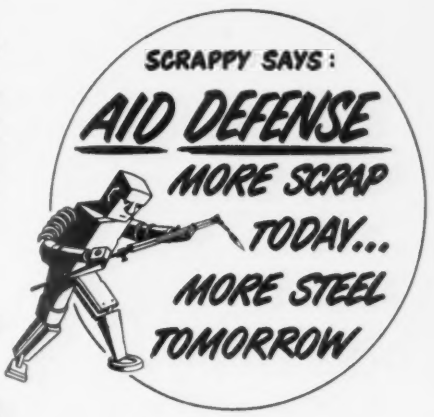
We *do* have the scrap. It's everywhere, not just in the form of *production* scrap—the "leavings" of machining, normally turned over to scrap dealers . . . but also in the form of *idle* metal: obsolete machines and tools, no-longer-usable jigs and fixtures, gears, chains, pulleys, valves, pipe, abandoned steel structures, etc.

We must have this *idle* metal to keep the furnaces running.

Please cooperate. Set up a Scrap Salvage Program in your plant—*now.* For a complete plan on "how to do it", write for booklet "Top Management: Your Program for Emergency Scrap Recovery". Address Advertising Council, 25 W. 45 Street, New York 19, N. Y.

Why Do We Need *Scrap?*

Steel is made half from pig iron, half from scrap. With production on the increase, more scrap must be purchased. And it's up to you to "dig it out" and sell it.



NON-FERROUS SCRAP IS NEEDED, TOO!

This advertisement is a contribution, in the national interest, by

FOUNDRY

A PUBLIC SERVICE PROJECT · THE ADVERTISING COUNCIL

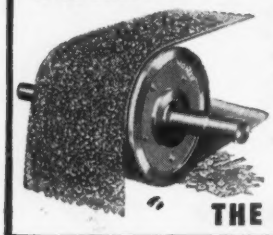
FOR SAND SLINGERS, CONDITIONERS AND CONVEYORS . .

HERE IS THE ANSWER TO YOUR MAGNETIC SEPARATOR JOBS!

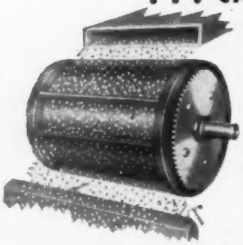
HOMER "Power-Plus" Magnetic Separators

Permanent non-electric—Unaffected by Heat, Cold, Moisture

. . . CAN BE USED INSIDE or OUTSIDE PLANT . . .

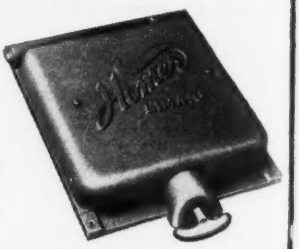


Homer MAGNETIC PULLEYS and UNITS —Available in standard diameters from 12" to 30"; belt widths 4" to 60". Special sizes upon order.



Homer MAGNETIC DRUMS—Available in standard diameters from 12" to 30"; face widths 4" to 60". Can be furnished with or without enclosure.

Homer MAGNETIC PLATES — Available in standard widths from 4" to 26"; lengths and number of poles as required. Special fabrications to your specifications.



Write for descriptive bulletins

THE HOMER MANUFACTURING CO., INC., DEPT. 156, LIMA, OHIO

EF

GAS, OIL AND ELECTRIC FURNACES

For all annealing and heat treating requirements

THE ELECTRIC FURNACE CO. • SALEM, OHIO

CHEMISTS and METALLURGISTS

Grey Iron Foundry Consultants

Complete Foundry Testing

Established over 25 years

A. H. PUTNAM COMPANY

Rock Island, Illinois

PRODUCERS CORE SAND CORPORATION

PITS AT MICHIGAN CITY, INDIANA AND SAWYER, MICHIGAN

MICHIGAN CITY, INDIANA

COST CONTROL WESTOVER ENGINEERS

Westover ENGINEERS

FOUNDRY MANAGEMENT CONSULTANTS

3110 WEST FOND DU LAC AVE., MILWAUKEE 10, WIS.

There is no better time than NOW to review incentives, methods, scheduling, production control and paperwork processes.

WELLMAN

Williams Type

INSTANT "ON-AND-OFF" SERVICE ANYWHERE

The Wellman "Hook-on", single-line bucket is designed to provide clamshell bucket service at any crane hook where suitable head room and hoist capacity are available.

Hook the yoke over the crane hook and the bucket is ready for work. When the job is finished, take the yoke off the hook and the crane is free for other duties.

Capacities from ⅜ to 2 cubic yards. Write for free bulletin.

THE WELLMAN ENGINEERING CO. 7019 CENTRAL AVE. CLEVELAND 4, OHIO

ANALYSIS OF CASTING DEFECTS

133 pages, illustrated

Price $4.25 Postpaid

To help foundrymen minimize and eliminate defective castings. Thirty-one basic casting defects are listed and described. Defects are defined simply and completely, illustrated by 101 figures collected from foundries of the United States and Canada.

THE PENTON PUBLISHING COMPANY

Book Department

1213 W. 3rd St., Cleveland 13, Ohio

EMPIRE

"THAT GOOD"

FOUNDRY COKE

DeBARDELEBEN COAL CORPORATION

2201 First Ave., North • Birmingham 3, Ala.

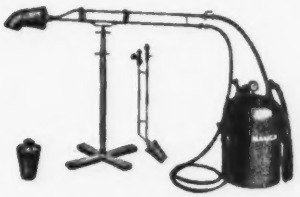
Phone 3-9135

HAUCK OIL AND GAS BURNING EQUIPMENT

for
- CUPOLA LIGHTING
- MOLD DRYING
- LADLE HEATING
- CORE BAKING
- FURNACE HEATING

Featuring
3 BIG OPERATIONS WITH 1 EQUIPMENT

Compressed air portable oil burner equipment for lighting cupolas and drying molds. Also hand pump types.



This Hauck All-Purpose Unit with interchangeable Burners and Nozzles, lights cupolas, heats ladles, dries molds. Fast, efficient—easy to handle. Burner flame adjustable and can be directed from any angle. Nothing like it for superior performance. Get Hauck Foundry Catalog.

Venturi compressed air "suction" hand torches — no preheating, for drying linings, cores, molds.

Portable venturi high pressure oil burners with adjustable burner stand for heating and drying ladles.

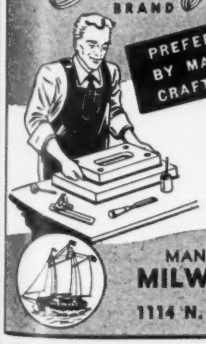
HAUCK MANUFACTURING CO.
106 Tenth St., Brooklyn 15, N. Y.

Venturi low pressure and high pressure air atomizing oil burners for ladle heating, core and mold ovens, melting and annealing furnaces.

FOUNDRY CORE PRACTICE
Second Edition
By Harry W. Dietert
Devoted completely and in great detail to the production of cores. Will prove beneficial to every foundryman.
548 pages illustrated — $10.00 Postpaid
THE PENTON PUBLISHING COMPANY
Penton Building — Book Dept. — Cleveland 13, Ohio

STANDS 50,000 LB. LOADS • 60 seconds after application
SWIFT-FLOOR
FLOOR RESURFACER
No production delays. Just prime, fill, tamp — over wood, concrete, steel for new floor or patch. Write for free book!
MONROE MAINTENANCE MATERIALS
THE MONROE COMPANY, INC.
CLEVELAND 6, OHIO

"Craft" BRAND **LEATHER FILLET**



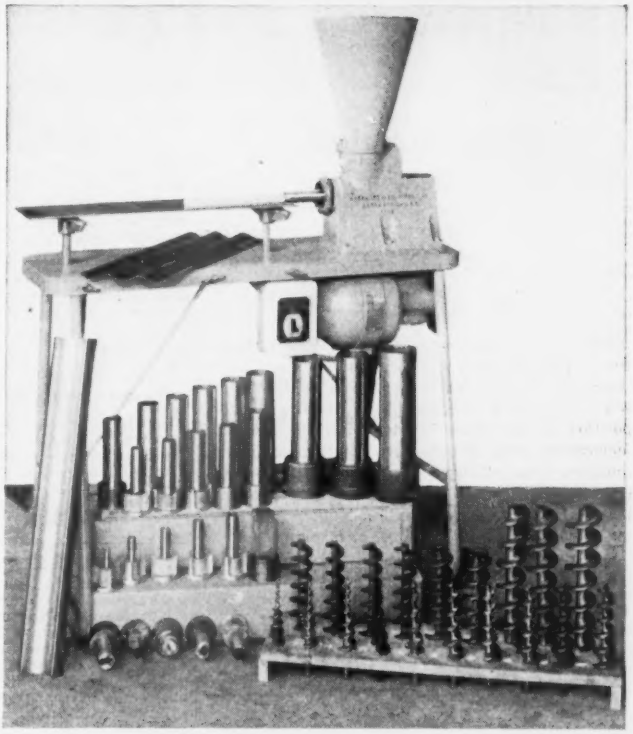
PREFERRED BY MASTER CRAFTSMEN

Write for samples and quotations.
Immediate shipment from stock.

- **PLIABLE** Easy to work with.
- **FINE FEATHER EDGE** Fine bevel edge fits perfectly.
- **CUT TO CORRECT RADIUS** Correct when pressed into place.

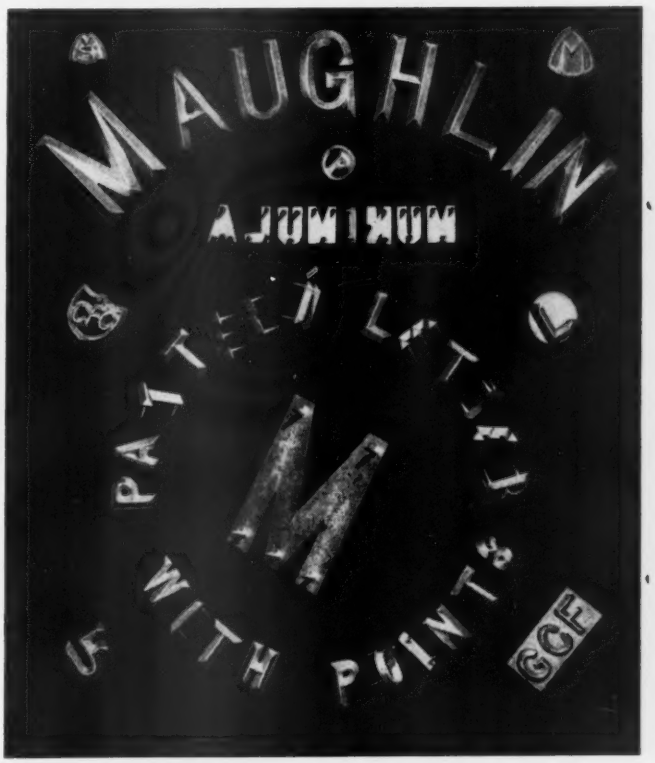
MANUFACTURED BY
MILWAUKEE LEATHER BELTING CO.
1114 N. Water St. — Milwaukee 2, Wis.

STOCK CORE EXTRUDERS



Wadsworth #1 Capacity ⅜" to 3"
By: **WADSWORTH EQUIPMENT CO.**
555 La Follette St., Akron 1, Ohio

A Hammer Blow Secures Letters To Pattern



THE H. P. MAUGHLIN CO.
953 Ingleside Ave., Columbus, Ohio
Manufacturers of letters and numbers exclusively for over 30 years

CLASSIFIED ADVERTISING

Help Wanted

CORE ROOM FOREMAN

Cincinnati manufacturer has immediate opening for a qualified core room foreman. Must have thorough core making experience in all details of sand mixes and machine core making. This position is permanent and offers an excellent opportunity and an attractive salary plan to the qualified man. Interviews arranged after receipt of detailed record of core room experience and personal history. All replies will be held in strict confidence.

BOX 621

FOUNDRY **CLEVELAND 13, OHIO**

BRONZE FOUNDRY FOREMAN

Experienced in overhead sand feed units, modern type equipment to be installed at year end. Foundry will have seven new units, rollover machines, floor and tub molders. Medium size operation, casting bronze for locomotive fittings, brass valves, marine castings, etc. Thorough knowledge required of gates and risers, patterns and core boxes. Includes supervision of core and cleaning rooms. Successful operator if possessing good knowledge of iron foundry could become superintendent of the whole foundry operation. Situated Eastern part of Canada. Good salary to right man. Welfare conditions good, pension plan, etc. Write stating age, experience, salary expected, when available. Address: Box 598, FOUNDRY, Cleveland 13, Ohio.

SELLING SALES MANAGER
GRAY IRON

Experienced volume producer desires to contact Foundry principals interested in strengthening present sales organization or taking over and building new. Can originate new business while building friendly relations with present customers. Active buying contacts cover major mid-western organizations in Industrial, Farm Implement, and Automotive fields. Salary and bonus based on performance. Available on short notice. Address: Box 626, FOUNDRY, Cleveland 13, Ohio.

METALLURGIST

Experienced metallurgist to supervise acid electric furnace department and laboratory for modern miscellaneous and semi-production steel foundry. Excellent opportunity for right person. Good salary, insurance and bonus. State qualifications and expected salary. Location—Detroit area.

BOX 610

FOUNDRY **CLEVELAND 13, OHIO**

CLEANING ROOM FOREMAN

Experienced foreman for miscellaneous and semi-production steel foundry. Must have thorough knowledge of heat treating. Excellent opportunity for right person. Good salary, insurance and bonus. State qualifications and expected salary. Location—Detroit area. Address:

BOX 611

FOUNDRY **CLEVELAND 13, OHIO**

FOUNDRY SUPERINTENDENT

Excellent opportunity for the man willing to assume full responsibility for the operation of an aluminum foundry. Must be completely experienced in the production of both sand and permanent mold aluminum castings. Experience in castings for aircraft essential. In reply state salary expectations, experience and technical knowledge. Address: Box 616, FOUNDRY, Cleveland 13, Ohio.

Help Wanted

FOREMAN AND ENGINEER WANTED

Two different positions to be filled in Central New England Gray Iron Jobbing foundry—

ENGINEER—FOUNDRY FOREMAN

Experience essential. State age, qualifications and salary requirements.

BOX 591

FOUNDRY **CLEVELAND 13, OHIO**

STEEL FOUNDRY SUPERINTENDENT

Wanted for well established Southern jobbing foundry producing carbon and alloy steels. Excellent living conditions. Only applicants who are looking for a permanent job need apply. Give details of experience and salary desired in first letter. Address: Box 534, FOUNDRY, Cleveland 13, Ohio.

ASSISTANT PLANT SUPERINTENDENT

The man we are looking for must have practical background on nonferrous castings of every description—namely art bronze markers and memorials, jobbing castings, cast in aluminum bronze, manganese bronze, phosphor bronze and aluminum alloy aircraft castings. He must be able to assist in directing entire personnel not only in the foundry but in the pattern shop, grinding, finishing, coloring and shipping departments as well. Address: Box 531, FOUNDRY, Cleveland 13, Ohio.

MOLDING SUPERVISOR

Production man to supervise operation of squeezers and bench work. Must be able to train men. Opportunity for advancement with long established company. Write stating full qualifications and experience. All replies held confidential.

PERSONNEL MANAGER
THE EASTERN MALLEABLE IRON COMPANY
P. O. BOX 349
WILMINGTON 99, DELAWARE

FOUNDRY SUPERINTENDENT

For shop producing 500 tons carbon and alloy steel, 300 tons electric iron and 150 tons brass pressure vessel castings per month. Must have broad and extensive experience in foundry operations, proven administrative ability, and good practical and technical background. Excellent opportunity with long established company of best reputation.

Reply in confidence giving full information as to age, background and experience as well as salary requirements. Address: Box 470, FOUNDRY, Cleveland 13, Ohio.

GENERAL FOUNDRY SUPERINTENDENT

A well established grey iron, brass, bronze and aluminum jobbing foundry in Southwestern Michigan with 125 employees is seeking the services of a general foundry superintendent. The man we employ must have technical knowledge and experience in metallurgy, know all phases of foundry work and have ability to handle men. Kindly state age, education, experience and salary requirements. Address: Box 595, FOUNDRY, Cleveland 13, Ohio.

PATTERN SUPERINTENDENT

Mid western malleable foundry desires pattern maker with knowledge of malleable gating and rigging. Permanent position. State salary expected. Address: Box 589, FOUNDRY, Cleveland 13, Ohio.

GENERAL FOUNDRY FOREMAN

Wanted for gray iron foundry in New York State. Not mechanized. Experience in floor and machine molding and all phases of foundry operations. Advise age, experience and starting salary. Address: Box 605, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERVISOR

Foundry near Philadelphia, gray iron production 50 to 75 tons. Thorough knowledge of molding department, core room, sand equipment, cupola, patterns, etc. Excellent opportunity for advancement. Address: Box 618, FOUNDRY, Cleveland 13, Ohio.

Help Wanted

FOUNDRY SUPERINTENDENT

For large aluminum sand foundry in the Middlewest. Must be experienced in foundry operations. Address: Box 581, FOUNDRY, Cleveland 13, Ohio.

JOLT-STRIP FOREMAN

Foreman to set up and supervise mechanized rollover and jolt squeeze strip production line. Must be experienced on this type unit producing high production. This is a new production line in the East. State age and experience. Address: Box 500, FOUNDRY, Cleveland 13, Ohio.

MELTER

Acid electric steel foundry, carbon and low alloys. Cleveland district. Address: Box 583, FOUNDRY, Cleveland 13, Ohio.

METALLURGIST

College education plus five to ten years' experience in the nonferrous casting field. Work involves technical writing, field service, physical testing, plant research and development and quality control. Address: Box 612, FOUNDRY, Cleveland 13, Ohio.

CHIEF INSPECTOR

In malleable foundry in Midwest. Must be capable of layout work and had some experience in malleable work. Please state age, experience and salary expected in reply. Address: Box 622, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT
EXPERIENCED BRASS FOUNDRYMAN

To operate and supervise entire foundry operations of progressive plumbing supply manufacturer located in Southwestern Ohio. Must have technical knowledge and ability in all phases of brass foundry work. The nature of the position, salary, stability, location, working conditions and company benefits make this an extremely attractive opportunity. Address replies in full confidence giving full information to

BOX 634

FOUNDRY **CLEVELAND 13, OHIO**

SALESMAN

Wanted to represent two fast growing gray iron foundries, one specializing in high production medium and small castings, the other jobbing medium and heavy. Located in Northern Indiana and Southwestern Michigan. Foundry and machinery sales experience desirable, but not essential. Salary plus expenses and bonus based on sales. Results can lead to sales manager position. Write giving experience and availability to:

BOX 632

FOUNDRY **CLEVELAND 13, OHIO**

ENGINEER

Experienced in structural design. Prominent builder essential foundry equipment, over thirty years. Forty hours plus overtime. Address: Box 596, FOUNDRY, Cleveland 13, Ohio.

Representative Wanted

SALES REPRESENTATIVE

Pneumatic accessory tools and appliances foundry and industrial trade—Cleveland or Pittsburgh area. State qualifications, experience and requirements. Address: Box 602, FOUNDRY, Cleveland 13, Ohio.

CANTON NONFERROUS FOUNDRY

Is looking for a live wire representative, well introduced among the users of aluminum, brass and bronze castings in Southern half of Ohio. Address: Box 609, FOUNDRY, Cleveland 13, Ohio.

Positions Wanted

COREROOM FOREMAN
OR
WORKING FOREMAN

Twenty years' experience in large production iron and steel foundry. Also experience in core making in brass and aluminum. Address: Box 599, FOUNDRY, Cleveland 13, Ohio.

Positions Wanted

SUPERINTENDENT

Practical gray iron foundryman, molder by trade, technically trained graduate metallurgist. Broad background of experience in general jobbing and high production of quality castings. Well versed in all phases of the foundry. Dry and green sand, pit molding, cores, cupola and metal control. Wants connection with progressive foundry needing real foundryman that can produce required results. Address: Box 546, FOUNDRY, Cleveland 13, Ohio.

MANAGER—ASSISTANT TO PRESIDENT

Steel, iron, brass. Thoroughly experienced in every shop operation, metallurgy, engineering, accounting and management. Excellent ability to develop a superior organization by leading, teaching and example. Outstanding reputation for keen analysis, sound judgment and a rare combination of practical experience, managerial ability and effective personality. Address: Box 375, FOUNDRY, Cleveland 13, Ohio.

SALESMAN—STEEL AND IRON FOUNDRY

Metallurgist, desires to relocate. Energetic, reliable, age 36. Melting and laboratory experience on acid electric furnace making carbon and alloy steel. Excellent references. Southwest preferred. Address: Box 631, FOUNDRY, Cleveland 13, Ohio.

CORE ROOM SUPERINTENDENT

Age 43. Experienced in all phases of coremaking, including sand mixing, drying and assembling. Can handle large groups of workers, male and female. Trouble shooter on cored castings. Very good on production. Will relocate. Address: Box 594, FOUNDRY, Cleveland 13, Ohio.

FOREMAN OR ASSISTANT SUPERINTENDENT

Twenty years in nonferrous foundry work, 10 years in supervision from assistant foreman to assistant superintendent of 30 molder foundry. Light and medium castings. Can handle men, know molding, melting cores and scrap conscious. 39 years of age. Prefer Northern Ohio but will consider other locations. Available at once. Address: Box 601, FOUNDRY, Cleveland 13, Ohio.

PRACTICAL GRAY IRON FOUNDRY MAN

Desires position as foreman or superintendent in production or jobbing shop. Over 25 years' proven ability as foreman and superintendent. A-1 on cupola practice. All types of molding in green and dry sand also good rigger for production. Address: Box 586, FOUNDRY, Cleveland 13, Ohio.

WORKS MANAGER OR FOUNDRY SUPERINTENDENT

Age 46, practical and technically trained. Commercial jobbing and production work. Twenty-eight years' experience of which twenty-five were in executive capacity. Well versed in all phases of jobbing and production work in brass, bronze, aluminum and iron castings. Progressive and up to date in modern methods. Capable of taking complete charge of foundry or foundries. Salary expected $10,000 per year plus bonus. Available on short notice. Address: Box 548, FOUNDRY, Cleveland 13, Ohio.

FOUNDRYMAN

Of 35 years' experience in all phases of nonferrous foundry practice and selling own work, wishes to take complete charge of a small nonferrous foundry in a small town of not over 50,000. Will run it on salary or salary and profit. Will go anywhere. Address: Box 604, FOUNDRY, Cleveland 13, Ohio.

MANAGER OR SUPERINTENDENT

Twenty-eight years of foundry experience in grey iron production and jobbing work. Ten years of practical and technical training with eighteen years in executive capacity. Experience in semi or mechanized shops. Age 46, best of references. Address: Box 357, FOUNDRY, Cleveland 13, Ohio.

GENERAL MANAGER

Mature, profit-minded, dependable. Has successfully managed four companies—two taken out of the red. Available for service shortly with medium-size company requiring reliable directing ability in management, sales finance and production. Excellent experience, foundry, machine and related lines. Address: Box 235, FOUNDRY, Cleveland 13, Ohio.

Positions Wanted

GENERAL FOREMAN

Can take full charge of small or medium sized iron foundry. Practical molder, technical training. West of Rockies preferred. Address: Box 551, FOUNDRY, Cleveland 13, Ohio.

MANAGER—SUPERINTENDENT

Grey iron and malleable foundryman with 20 years' executive and consulting experience. Well versed in molding, melting, duplexing, metallurgical and production procedures. Address: Box 633, FOUNDRY, Cleveland 13, Ohio.

PRACTICAL—TECHNICAL

Modern grey iron foundryman, age 49. Molder by trade, graduate metallurgist. Outstanding background of experience and ability in highly mechanized high production foundry, using most modern methods and equipment. Machine tool, high pressure castings, diesels, automotive. Sound in sand control, molding, cores, cleaning, working from blueprints and minimum costs. Wants to connect with sound reliable firm needing services of a high type foundryman to get results. Address: Box 544, FOUNDRY, Cleveland 13, Ohio.

GREY IRON FOUNDRYMAN

Available. Capable, qualified and experienced to direct all phases of foundry activities. Light to medium heavy work. Green and dry sand. Well versed in cupola operation and metallurgy. Fifteen years in present executive position. Middle aged. Good appearance. Pleasing personality. Address: Box 603, FOUNDRY, Cleveland 13, Ohio.

NONFERROUS FOUNDRY MANAGER OR GENERAL SUPERINTENDENT

Twenty-four years' experience — over eighteen years in supervision, sales and management. Complete practical experience and technical knowledge. Production and jobbing. Address: Box 620, FOUNDRY, Cleveland 13, Ohio.

BRONZE MOLDER

Ornamental bronze molder desires position in Chicago district only. Can take full charge of foundry. Not interested in any other part of the country. Address: BOX 580, FOUNDRY, Cleveland 13, Ohio.

SUPERINTENDENT

Thirty years' experience in gray iron foundry. Familiar with all phases of foundry operations. Can also quote prices on inquiries. Available after October 1st. Address: Box 614, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY MANAGER OR SUPERINTENDENT

Practical, progressive, experience of 27 years in small, medium and large castings in cast iron and nonferrous metals. Take charge of all phases of work in office and foundry. Employed. Address: Box 316, FOUNDRY, Cleveland 13, Ohio.

JUNIOR METALLURGIST

B.S. Metallurgical engineering. Two years' experience in metallurgical and chemical laboratory, melting and annealing departments of ferrous foundry. Now employed. Desire work in metallurgical capacity with reliable firm. Address: Box 608, FOUNDRY, Cleveland 13, Ohio.

Wanted-To-Buy

WANTED

STATIONARY SPEEDSLINGER—1200 & 1800 RPM. MUST BE IN EXCELLENT CONDITION.

BOX 565

FOUNDRY CLEVELAND 13, OHIO

EQUIPMENT WANTED

Direct arc electric furnace, either Heroult or Pittsburgh Lectromelt, 500 pounds per hour. Complete with electric control board and transformers.

ATLAS FOUNDRY COMPANY
517 LYONS AVENUE
IRVINGTON, NEW JERSEY

Wanted-To-Buy

WANTED

1—42" or 72" American Wheelabrator

2—120" cupolas with charger, weigh hopper, scale and blower.

BOX 615

FOUNDRY CLEVELAND 13, OHIO

WANTED

1—Osborn #403-W Jolt Rollover Pattern Draw Machine.
2—Jolt Strippers 10" Draw
2—Jolt Strippers 12" Draw
1—Osborn #602 Jolt Rollover Pattern Draw
1—Osborn #243 or #643 Jolt Rollover Pattern Draw Machine.
1—American Wheelabrator 36"x42" or 42"x48" Tumblast.
2—Osborn #442 or #444 Jolt Rollover Pattern Draw Machines.
2—Osborn Coreblowers #92 or #93 or equal.

FALL RIVER FOUNDRY CO., INC.
1148 DAVOL STREET
FALL RIVER, MASS.

WANTED

BRIDGE CRANES

ARNOLD HUGHES COMPANY
765 PENOBSCOT BLDG. DETROIT 26, MICH.
WOODWARD 1-1894

WANTED

One gas fired core oven with controls, either drawer type or push in type. Desirable inside dimensions 5 to 6 feet wide, 6 feet high, 6 to 7 feet deep. State make, condition and price in first reply. Address: Box 448, FOUNDRY, Cleveland 13, Ohio.

WANTED

Sand Blast & Foundry Equipment & Parts.
Address: DIAMOND SALES, INC.
5654 WEST JEFF., DETROIT 9, MICH.

WANTED

Complete laboratory for chemical analysis of gray iron. Address: STILLMAN FOUNDRY COMPANY, GRAND RAPIDS 4, MICH.

WANTED

Electric steel furnace—one, two or three tons. Fully electrically equipped giving all electric specifications. Also give location in order that inspection can be made. Address: Box 607, FOUNDRY, Cleveland 13, Ohio.

WANTED

Pottstown tappers for pipe fittings, capacity 1" and 2" for foreign use. Address: Box 557, FOUNDRY, Cleveland 13, Ohio.

WANTED

Pattern equipment for pressure pipe fittings, plumbing drainage fittings and allied lines. Address: Box 606, FOUNDRY, Cleveland 13, Ohio.

WANTED

Tabor cutoff machine, 7½ or 10 HP. Address: CASTWELL FOUNDRY COMPANY, 81 WYTHE AVE., BROOKLYN, NEW YORK.

MIXERS WANTED

Used Simpson Intensive Sand Mixers. State size, condition and lowest cash price or immediate acceptance. Address Box 578, FOUNDRY, Cleveland 13, Ohio.

WANTED

1—30 ton, 230 volt, DC, 50' span, with 50' lift traveling crane. Address: ERIE ELECTRIC CO., INC., BUFFALO 2, NEW YORK.

CLASSIFIED ADVERTISING

Opportunity

YOUR FOUNDRY PROBLEM

Can be solved, your plant or mine. Foundry operator trouble-shooter in sand castings and permanent molds, ferrous and nonferrous. Submit any foundry problems.

WAGNER PERMANENT MOLD CO.
2910 EMPIRE AVENUE
BURBANK, CALIFORNIA

FOR SALE

Complete pattern equipment for malleable pipe fittings sizes ⅜" to 2", or will cooperate with a foundry to produce. Address: LAKESIDE FOUNDRY, WARSAW, INDIANA.

Accounts Wanted

ACCOUNTS WANTED

Commission salesman operating among the best accounts in Ohio, Western New York and Pennsylvania, Indiana and Michigan would like a connection with a gray iron foundry equipped to produce quality castings up to about 5 to 10 tons. Address: Box 619, FOUNDRY, Cleveland 13, Ohio.

Foundry For Rent

GRAY IRON JOBBING FOUNDRY FOR RENT

Foundry with two cupolas, 50,000 square feet floor space, five ton overhead traveling crane over molding floor core room with 3 gas and 2 coke fired ovens and B & P speedmuller. Cleaning room with Pangborn table rotoblast, Sly sand blast and overhead crane. Capacity 30 to 40 tons per day. Available February 1, 1952.

COVEL MANUFACTURING CO.

BENTON HARBOR **MICHIGAN**

Available Capacity

AVAILABLE CAPACITY

Our foundry has open capacity to supply small and medium size gray iron castings. Send sample. Address: OREGON CASTINGS CO., RD 3, Lititz, Pa.

Employment Service

SALARIED POSITIONS

$3,500 to $35,000. We offer the original personal employment service (established 41 years) Procedure of highest ethical standards is individualized to your personal requirements. Identity covered; present position protected. Ask for particulars. Address: R. W. BIXBY, INC., 101 DUN BUILDING, BUFFALO 2, NEW YORK.

SALARIED PERSONNEL

$3,000-$25,000. This reliable service, established 1927, conducts confidential negotiations for high grade men who seek a change of connection under conditions assuring if employed full protection to present position. Send name and address only for details. Personal consultation invited. Address: JIRA THAYER JENNINGS, 241 ORANGE STREET, NEW HAVEN 10, CONN.

Employment Service

FOR APPLICANT AND EMPLOYER

A competent, confidential placement service, by a Counselor whose years of experience is backed by 15 years of Supervisory and Management work in Foundry and Machine Shop.
We have openings for qualified men, as:

Plant Managers	Superintendents
General Foremen	Mold Foremen
Core Foremen	Melting Foremen
Cleaning Foremen	Maintenance Foremen
Pattern Foremen	Metallurgists
Industrial Engrs.	Time Study Engrs.

And all other Administrative and Sales Positions.

WRITE OR CALL: JOHN COPE
EMPLOYMENT COUNSEL, INC.
"All the name implies"
SUITE 500 **7 WEST MADISON ST.**
CHICAGO 2, ILLINOIS **FINANCIAL 6-2100**

Capacity Wanted

CASTINGS WANTED

Midwest manufacturer seeks foundry capable of casting gray iron vessels varying in sizes from 30 inches to 60 inches in diameter, 36 inches to 90 inches in height, 1200 to 6000 pounds. Vessels must be leak proof at 50 to 60 pounds pressure.

BOX 617
FOUNDRY **CLEVELAND 13, OHIO**

REPRESENTATIVE WANTS GRAY IRON CAPACITY

Slinger, Bumpers, or Roll-over, for production and Semi-production runs. Write in detail as to Tonnage available, Type of Molding units, Core and Cleaning room equipment, Core capacity, and if you have Pig and Coke. Should be within Two hundred mile radius of Chicago. Commission basis. Address: Box 625, FOUNDRY, Cleveland 13, Ohio.

Foundries For Sale

FOUNDRIES FOR SALE

IRON FOUNDRY. Good building and equipment. Steady customers. Located in small town with good labor supply. Bargain at $40,000.

IRON FOUNDRY. Modern equipment for quantity production of castings up to 100 lbs. Producing 25 tons daily. Good organization. Profitable. Priced to sell.

EDWARD H. ZOLL

FOUNDRIES SOLD AND LEASED

790 BROAD ST. **NEWARK 2, N. J.**

FOR SALE

GREY IRON FOUNDRY IN LOS ANGELES COUNTY. FURNACE HAS BEEN APPROVED BY THE COUNTY AIR POLLUTION. ALUMINUM AND BRASS FURNACES. ALSO FULL HALF ACRE ON NEW STATE HIGHWAY. NEW OFFICE JUST COMPLETED. ALL MUST GO $20,000 FULL PRICE—$10,000 DOWN.

COTTRELL CASTING CO.
2429 E. ARTESIA ST. LONG BEACH 5, CALIF.

FOUNDRY FOR SALE

Most profitable medium size jobbing foundry in this section of the country. Well equipped, situated between Cleveland and Detroit. Arranged for production. Deal involves $250,000.00. Owners must retire. Opportunity for user of castings with certificate of necessity. Address: Box 340, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY—GRAY IRON

Brick and steel foundry with two clear spaces 80 x 320 ft. with overhead monorail, story height 13 ft. 6 in., gable 23 ft., attached building 40 x 50 ft., story heights 15 ft. 6 in. and 13 ft. 4 in., has two No. 7 Whiting cupolas 72 in. in diameter. Contains equipment, ideal for mechanized operation, plenty dumping ground, built 1917, composition roof, vicinity population about 9000, near center of U. S. population, expect natural gas this year, served by two major railroads, water transportation available, city hydrant fire protection, land for expansion. Subject to withdrawal without notice. Address: Box 358, FOUNDRY, Cleveland 13, Ohio.

Foundries For Sale

GRAY IRON JOBBING FOUNDRY ON PACIFIC COAST

$30,000 total cost for going foundry near San Francisco Bay Area. Well equipped. Ten year lease. This is a real opportunity for the right party. Unlimited possibilities. Address: Box 600, FOUNDRY, Cleveland 13, Ohio.

SMALL FOUNDRY FOR SALE

On New York Central Railroad side track in Lockport, New York. Floor space of molders approximately 11,000 square feet with exceptional dumping ground for disposal of slag and waste indefinitely at lowest expense over declivity on the land. Considerable foundry equipment thrown in for the price of assessed value of the real estate. Address: JEFFERSON UNION COMPANY, LOCKPORT, NEW YORK.

NONFERROUS FOUNDRY FOR SALE

Located in the heart of the Ohio-Kentucky-West Virginia industrial area. Large volume of orders with government authorization for material. Owners must retire from business. Price—$50,000.

BOX 623
FOUNDRY **CLEVELAND 13, OHIO**

FOR SALE

Nonferrous foundry in large Wisconsin industrial town. Get in at the start. We have a large volume of defense orders. Owners must retire. Price $50,000. Address: Box 504, FOUNDRY, Cleveland 13, Ohio.

PRODUCTION FOUNDRY FOR SALE

22,000 sq. ft. buildings. Capacity 20 air squeezer floors, 15 running. Completely equipped; 54" Whiting cupola with skip hoist charger; air compressors; 40 x 48 Wheelabrator. Price $125,000. Northern Indiana. Address: Box 556, FOUNDRY, Cleveland 13, Ohio.

For Sale

FOR SALE

1—Handy Sandy Sand Handling Apparatus with
1—Reddy Sandy portable Shakeout and Tempering Unit.
8—Rockover Core Machines
3—International Jolt Rollover Power Draw Molding Machines
1—403 Osborn Molding Machine
1—602 Osborn Rollover
2—American Clay 9' Mullers
1—A A 72" Sandcutter
1—New Sand Unloader
1—Modern Pouring Device, 200# Covered Ladle
1—#0 Whiting Cupolette
2—Arcade Rollover Portable Molding Machines
CUPOLAS BLOWERS ROLLER CONVEYOR
Send for our four page list.

UNIVERSAL MACHINERY & EQUIPMENT CO.
320 EAST BROAD ST.
SHILLINGTON, READING, PENNA.

For Sale

EQUIPMENT FOR SALE

Wheelabrator cabinet 3 wheels 19" 20 HP electric motors and controls, conveyor system diameter of cabinets 21'9" x 10' for designed wheel peening shot peening.
Pangborn 6' LJ table direct pressure 4 nozzles with 2AQ6 generator, 7BVR abrasive separators.
2 HP elevator, conveyor, designed for shot peening 20 MM shells. Price $1000.
Pangborn EN2 cabinet 36" by 60". Price $225.
Pangborn suction cabinet size 36" x 48". Price $200.
Electric sand sifter vibrator 1/3 HP motor Foundries Supplies Mfg. Co. Price $95.
2 cylinders Westinghouse air compressors model L4Z direct connected to a 25 HP, 3 phase, 60 cycles, 850 RPM, 153 CFM, 110 lbs. pressure. Price $750.

M. ELSTEIN
141 MANGIN ST. NEW YORK 2, N. Y.

FOR SALE
MOLDING MACHINES

4—International power jolt R.O. foot draw for flasks 20" wide, 8" draw
1—Same type for 24" width flasks, 10" draw
1—Simplicity 4' x 8' Vibrating Screen, 5 HP motor
1—B. & P. Model "S" Screenarator

RAY P. SCULLY
SCULLY MACHINERY & EQUIPMENT CO. NOT INC.
767 MILWAUKEE AVE. CHICAGO 22, ILL.
PHONE: CANAL 6-0314

FOR SALE

1 Ajax tilting induction metal melting furnace, 650 pounds aluminum capacity, 60 KW, 100 KVA, complete with extra shell, electric hoist, transformer, lining material and insulating bricks, set of templates and molds for ramming, mounted static capacitors, panel board with ammeter, voltmeter and circuit breaker, in new condition. Address: Al-Fin Division, Farmingdale, N. Y.

SAND CONDITIONING EQUIPMENT

1—American Sandcutter Model A.A. 92" x 72", new 1948, Gasoline Driven, equal to new.
1—American Late Model A.M. Sandcutter 69" x 45", electric motor driven.

BOX 628
FOUNDRY CLEVELAND 13, OHIO

SAND BLAST FOR SALE

One New Haven model A sand blast machine; barrel size 36 x 46" with Westinghouse gear motor.

THE BUNTING BRASS & BRONZE COMPANY
715 SPENCER STREET
TOLEDO 1, OHIO

FOR SALE
IMMEDIATE DELIVERY

Ingersoll Rand, Chicago Pneumatic and Thor 1 x 8 portable grinders, Ingersoll and Chicago Pneumatic Chippers #2's & 3's. Write for price list.
No prices in excess of 60% of list.

SEATTLE PNEUMATIC TOOL CO.
535 ELLIOTT W. SEATTLE 99, WASH.

SAND CONDITIONING EQUIPMENT

1—Late Model Molder's Friend Sand Conditioner Excellent condition.

NARRAGANSETT GREY IRON FDRY.
130 WEST RIVER STREET
PROVIDENCE, R. I.

HEAVY DUTY MOLDING MACHINES

1—Davenport 48-SA jolt rollover pattern draw, 6000 lbs. capacity, 50" x 72" table, 24" draw.
1—Osborn #242 jolt rollover pattern draw machine excellent condition.
2—Osborn #403 jolt rollover pattern draw machines, excellent condition.

BOX 629
FOUNDRY CLEVELAND 13, OHIO

For Sale

FOR SALE

TURBO BLOWERS (3 Phase, 60 Cycle)

cfm	Pressure	Make	Motor H.P.	Volts	Speed
3500	40 oz.	Spencer	60	440	1800
220	24 oz.	Spencer	25	220/440	
450	40 oz.	Spencer	7½	220	1750
225	10 oz.	Spencer	1	220/440	3600

PRESSURE BLOWERS (3 Phase, 60 Cycle)

1500	1" SP	Sturtevant			625
9100	7" SP	Sturtevant			1900
4500	16 oz.	G. E.	30	440	3600
8150/62500	Bishop & Babcock			(40½x50 outlet)	
2500	7 oz.	Sturtevant	15	220/440	1800
2300	1" SP	Clarege	3	220/440	1800
950	16 oz.	Nth.Amer.	7½	220/440	3600
800	8 oz.	Nth.Amer.	3	220	3600
660	20 oz.	AllenBillmyre	7½	440	3600
450	6 lb.	A&B	30	220/440	3450
400	4.3 oz.	Spencer	2	220/3/60	3500
340	20 oz.	AllenBillmyre	3	440	3600

MOTOR REPAIR & MFG. CO.
1552 HAMILTON AVENUE
CLEVELAND, OHIO

FOR SALE

Conveyorized Ajax-Hultgren type H salt-bath heat treating furnace consisting of separately controlled preheat, high heat quench units. All transformers, pyrometer controllers, etc. Complete for immediate installation. Equipment in first class condition. Write: CENTRIFUGAL FOUNDRY COMPANY, MUSKEGON, MICHIGAN.

FOR SALE

CUPOLA in perfect condition, has been used for only 24 hours. Shell height 36 ft.; shell diam.: 32"; inside lining diam.: 22"; melting rate per hour: 2½ tons, with iron to coke ratio of 10 to 1; blast pipe nozzle inside diam.: 10"; foundation dimension: 48" x 48"; No. of tuyeres: 4; charging door: 14 ft. from floor; charging door dimension: 24" x 20". With one Sturtevant Fan No. 4. Price $500.00 F.O.B. car, St. Jerome. Address: ST. JEROME INDUSTRIES LTD., CASTONGUAY ST. WEST, TEL: 3767, ST. JEROME, TERREBONNE COUNTY, QUEBEC, CANADA.

FOR SALE

Reconditioned Ingersoll-Rand air hoists. Size "B" 1,000 lb. cap, Size "C" 2,000 lb. cap. and size "D" 4,000 lb. cap. New equipment guarantee. Address: HAYNES EQUIPMENT CO., INC., 144 FULTON ST., NEW MILFORD, N. J.

FOR SALE

2 Milwaukee Jolt Squeeze Machines, stationary type, Model 123-7, 12" Squeeze Cylinder, good condition, $275 each.
3 Model 1-34 Arcade Rollover Squeeze Drag Machines improved, modern, hand operated. $125 each.
1 Arcade Jolt Squeeze Machine, Model No. 91, 4" Jolt Cylinder, 10" Squeeze Cylinder, $150.

COLUMBIANA PUMP CO.
COLUMBIANA, OHIO PHONE: 383

FOR SALE

1—Used 60" x 144"—jolt rollover—draw; Herman Moulding Machine. For further information contact:

MR. A. BOLIN—GR 3556
CROWN IRON WORKS COMPANY
1229 N.E. TYLER STREET
MINNEAPOLIS 13, MINN.

FOR SALE

1—Coleman car type mold oven, oil fired, approximately 25 feet long, 16 feet wide, 11 feet high, door opening 8 feet, 4 inches, complete. Address: WEHR STEEL CO., 5234 W. Mobile St., Milwaukee 1, Wis.

FOR SALE

25 ton soft black annealed 11 gauge wire. Immediate delivery. Address: MR. S. J. MOLBY, WICHITA, KANSAS, PHONE 3-8473.

For Sale

FOR SALE

Two Johnston & Jennings jolt squeeze machines, #512 P, "Jackrabbit" portable, table size 18 x 22, never been used, in original crates. Also two Nichols jolt squeeze pattern draw machines, used. Several other jolt squeeze used machines. Address: THE COLONIAL FOUNDRY COMPANY, LOUISVILLE, OHIO.

FOR SALE

Royer foundry shake-out — manufactured by Royer Foundry & Machine Co., Kingston, Pa. Grid size 27" x 6'0", powered by a 2 HP Westinghouse type CS induction motor, 220 volts, 3 phase, 60 cycles. Good condition. Grid on machine is new with one complete spare grid. Address: H. B. IVES CO., NEW HAVEN 8, CONN.

MOLD CONVEYORS (2)

Bartlett & Snow—228 Ft. long; 60 Ft. wide; 113 cars—size 24" x 48". This is practically new equipment and can be purchased for about one half of the replacement cost. To the purchaser of these two conveyors we will give free part of an overhead sand system, consisting of six sand hopper chutes and monorail system with three control cars. Address: Box 624, FOUNDRY, Cleveland 13, Ohio.

CUPOLAS

2 No. 7 Modern Equipment Co. cupolas with inclined charger, weigh hopper, scale and blower. Almost new—for price and details write: BOHN ALUMINUM & BRASS CORP., 1400 LAFAYETTE BLDG., DETROIT, MICH.

FOR SALE

1—Osborn #602 Jolt Rollover Pattern Draw
2—Osborn #601 Jolt Rollover Pattern Draw Molding Machines.
2—International Type G Jolt Rollover Foot Draw Molding Machines, Open End 22" wide 10" draw.
2—Tabor Late Model Jolt Squeeze Portable Pin Lift Machines.
2—International Hand Rollover, 8" Draw Core Machines.
1—Spencer Turbo Compressor, 1300 Cu. Ft. per min. @ 32 oz. pressure. Direct connected to 25 H.P. Westinghouse Constant Speed Motor 1750 R.P.M.

BOX 630
FOUNDRY CLEVELAND 13, OHIO

FOR SALE
IMMEDIATE DELIVERY

1—Ransohoff Cleaning Mill 48" x 72", Side Loading, Side Unloading—Star Return—with Sand Handling Conveyor complete with tank, pump, switches and motors.—Excellent Condition.

FOUNDRY HOIST
1—3 ton R & M 2 motor AC foundry hoist.

PRESSURE BLOWERS
4—2010 CFM, 29 oz pressure, 12" discharge 15" suction Spencer Turbo Compressor, with 25 HP. 220/440 v. 3 ph. 60 cy. Motors.

DUQUESNE ELECTRIC & MFG. CO.
6428 HAMILTON AVE.
PITTSBURGH 6, PA.
TELEPHONE MO-1-5800

FOR SALE

#1 Simpson Sand Mixer—Intensive
Model "S" Beardsley & Piper Screenerator
1 Portable Magnetic Chip Separator
1 Brass Furnace
#405 Osborn Molding Machine
Portable Jolt Stripping Machine—Table Size 20 x 26
Adams Snap Flasks & Jackets—Size 12 x 18 & 10 x 20
Bottom Boards

BALCHER MACHINERY COMPANY
1284 S. COMPTON ROAD
CLEVELAND HEIGHTS 18, OHIO
PHONE: FAIRMOUNT 1-1186

CUPOLA FOR SALE

In good condition, one No. 6 Whiting cupola complete with stack. Price $700.00 FOB Bridgewater, Massachusetts. Address: BRIDGEWATER FOUNDRY CO., INC., OFF HIGH STREET, BRIDGEWATER, MASSACHUSETTS.

FOR SALE

One model AA—62" American sand cutter equipped with three phase, 60 cycle, 220 volt motors. Address: ATLAS FOUNDRY CO., MARION, INDIANA.

For Sale

CLASSIFIED ADVERTISING

FOR SALE
SURPLUS EQUIPMENT

Disc grinder, Gardner #120 less motor
Tool grinder, single wheel Diamond #1 less motor
(6) Snag grinders, 10 HP D.C. 2 wheel Marschke Black & Decker
Polishing Jack, double end, 1800 RPM Van Dorn 6 HP
(2) Back stand polishers, Divine with 12" pulley
(10) Blowers, #4-V
X-Ray unit, General Electric industrial visual inspection type cat. #A-4001-B, 60 cycle, 220 volt including special lead lined cabinet with Patterson type B fluoroscopic screen 18" x 26" area. Outside dia. 48" x 48" x 46". Panel Model V-1, type 4, 220 volt cat. #18989
Oven, muffle type gas fired Surface Combustion
Oven, normalizing gas-fired Peters-Dalton recirculating radiant tube type
Oven, gas fired American Gas Furnace #1
Furnace, 1000# rotary type Simplex
Jointer, "Moak" model J3-12, 1 HP motor, 440 volt
Chicago Pneumatic Air Hoist reversing eccentric, model C88, 4000 lbs. capacity (located at Mag. Fab.)
Turbo - compressor, "Spencer Turbine" 1000 CFM, 24 oz., 10 HP, 3500 RPM, 220/440, serial #30804, motor serial #333549
Vacuum Cleaner, portable, Spencer Turbine, serial #46220—440 volt, 3 HP. For mag. fdry.
Sand mixer, Simpson #2, serial #18596 with bevel gear drive, Link-Belt reduction unit and 10 HP G.E. motor 1800/3/60/220-440
Drill press, 1 spdl. floor type "Allen", serial #10309, ¾" quill, has step cone pulley and 1 HP motor, 1730/3/60/220-440
3 Snag grinders, 18" double end "Standard Elec." mod. 5HD, 5 HP. 220V-AC.
Ready power unit, model S-36 with Plymouth engine, starter, vapor muffler and rubber mountings, (F248)

BOHN ALUMINUM & BRASS CORP.
1400 LAFAYETTE BLDG. DETROIT 26, MICH.

FOR SALE

3—"G" Rollover Machines 20 x 8.
1—SPO Jolt Strip Squeeze Molding Machine.
2—Osborn J-75 Jolt Squeezers 10".
1—Sprue Cutter with 2 HP Motor.
1—North American Blower with 15 HP Motor. 2100 C.F.M., 16 oz. pressure.
6—10" New—Haynes Jolt Squeezers.
6—12" New—Haynes Jolt Squeezers.
1—Chicago Pneumatic Air Hoist.
1—Osborn Molding Machine Model 342-4.
1—#36 Osborn Core Draw Machine.
1—Lyon-Raymond Hyd. Lift Truck 2500 lb. capacity.
24—Adjustable Flask Clamps.
5—New, 1⅝" Osborn Vibrators.
300 ft. of Good Used ¾" Air Hose in 30 to 75 ft. lengths.
10—New, Squeeze Valves and Handles and 10—New Jolt Knee Valves for Milwaukee Jolt Squeezers
3—Adams Squeezers.
2—1000 lb. Worm Gear Covered Ladles.
1—24 x 48 Tumbling Barrel.
1—#55 Demmler Core Blower.
1—American Sand Cutter Machine Size 89/70 M.
1—Tabor Plain Bumper, 36" x 36" Table, 6" Piston and is 21½" High from base to top of Table.
2—Modern pouring devices.
2—International J.D.P. jolt strippers.

HAYNES FOUNDRY EQUIPMENT CO.
814 ADA St. KALAMAZOO 52, MICH.

FOR SALE

13 Walker York coke furnaces some take 22# crucible, 5 with good silica carbide lining and blowers. Others take #20 crucible, 2 silica carbide lined and blowers, remainder minus parts of linings or blowers. BLYSTONE 22" sand mixer with 2 HP motor. Address: THE WELSBACH CORPORATION, 1500 WALNUT STREET, PHILADELPHIA 2, PA.

FOR SALE

One 74/50 model AM, American sandcutter, equipped with 75-foot cable and crane bail. Motors—220-440 volts. Practically new. Address: Box 597, FOUNDRY, Cleveland 13, Ohio.

For Sale

FOR SALE

Pangborn #14 type GK-3 rotoblast barrel cleaning machine with dust collector. Barrel is 36" dia. by 48" long. Late Model in excellent condition.

CONNELL MACHINERY COMPANY
2318 MONROE STREET TOLEDO, OHIO
GARFIELD 6763

FOR SALE

2—Osborn Jolt, Squeeze, Rollover, Draw Molding Machine

1—Schneible Multi-Wash Dust Collector for 6500 CFM.

GUNITE FOUNDRIES CORPORATION
ROCKFORD, ILLINOIS

CLEANING EQUIPMENT

1—Ransohoff wet cleaning mill

1—Sly Centri-blast 8 foot airless table cleaning machine.

BOX 627

FOUNDRY CLEVELAND 13, OHIO

FOR SALE

Ransohoff End loading and unloading wet cleaning mill 56" x 72" tumbling compartment, capacity 25 cu. ft. per batch, 15 HP—3-60-440 motor, installed 1947, can be inspected in our plant. New liner installed approximately one year ago.

THE OLIVER CORPORATION PLANT #1
533 SOUTH CHAPIN STREET
SOUTH BEND 21, INDIANA

CUPOLA FOR SALE

Unused 90" cupola, vertical skip hoist charger, mixing ladle, Ingersoll-Rand 13,500 c.f.m. blower, all controls. Like new.

UNITED STATES STOVE COMPANY
SOUTH PITTSBURGH, TENNESSEE

FOR SALE

Used cast steel tight flasks 164 set, 19" x 22" x 7" cope 6" drag two man lift handles. Good condition. Any reasonable offer. Address: **JOHN WOOD COMPANY, ATTENTION D. D. McDONALD, MUSKEGON, MICHIGAN.**

FOR SALE

Foundry Rods—various diameters

WALLACK BROS.
7400 SOUTH DAMEN AVE.
CHICAGO 36, ILL.

TUMBLING MILLS FOR SALE

2—Whiting round tumbling mills 42" x 72" with 1¼" shells; combined clutch and brake control; single bench mounting; plain bearings.

1—Whiting round tumbling mill 30" x 72" with one inch shell. T&L pulley drive; single barrel on double bench; plain bearing.

1—Whiting round tumbling mill 30" x 48" with one inch shell. T&L pulley drive; single bench mounting; plain bearing.

THE BUNTING BRASS & BRONZE COMPANY
715 SPENCER STREET
TOLEDO 1, OHIO

For Sale

FOR SALE

MOLDING MACHINES
2—Deuscher Stationary jolt squeeze
1—International Type R Portable 24 x 10
1—International Type F Stationary 26 x 8
1—Osborn 74W Plain Squeeze Portable
2—Osborn 75W Plain Squeeze Portable
2—SPO #611B Stationary Oscillating Jolt Squeeze Strippers
BLOWERS FOR CUPOLAS AND FURNACES
1—#47 Connersville-Acme
2—#59 Connersville-Acme
2—15 HP Spencer Turbine 2250 CFM @ 16-oz.
1—Connersville rotary 24 cu. ft. per rev. 6200 C.F.M.
Maxon-Premix Blowers for Gas ¼ to 1 HP
METAL MELTING EQUIPMENT
5—1000# open flame brass melting furnaces, gas fired
1—Hausfeld 2000# aluminum capacity furnace, barrel type, open flame, oil fired
New 32" to 41" dia. shell cupolas made to order.
TUMBLING MILLS AND SAND BLAST
1—Pangborn style GJ-1 rotoblast barrel complete with Pangborn style FM automatic loader. Load capacity approx. 16 cu. ft.
1—Pangborn No. 2 GH direct pressure type sand blast barrel, motor driven. Complete unit.
1—Pangborn Sand Blast Unit, including generator tank, shot cleaner, bucket elevator. Suitable for use with room
MISCELLANEOUS
1—#1 Blystone sand mixer, motor drive
1—American Sand Cutter 72"
2—#16 Roto-clone units complete
1—Continuous Heat Treat Furnace 57' long, 1200° F. max.
25 Tons steel flasks in sizes from 26 x 26 to 60 x 60
1—Heavy Duty Flexible Shaft Grinders 2 HP
Complete stock of rebuilt mill and dust exhaust blowers

CLIFTON MACHINERY COMPANY
1023 W. SIXTH ST. CINCINNATI 3, OHIO

FOR SALE

TUMBLAST CABINET, Pangborn, model 1172A, ser. #7412911, Gravity Feed or Air Blast, 30" x 40" Barrel model 2 GD1, 2.7 rpm. Uses sand or shot. Good cond. All motors A.C. $1000.00 F.O.B..
CONVEYOR—all sizes and types.
SWING GRINDER, Mummert & Dixon, 24 x 4, excellent condition. .$450.00 fob.
TABOR — PORTABLE SHOCKLESS JARRING ROLL OVER & PATTERN DRAWING MACHINE—24" x 16", $350.00 fob.
SULLIVAN—AIR COMPRESSOR 11 x 10, 40 hp AC motor & starter $750.00 F.O.B.
MAGNETIC SEPARATOR, Ding's mfg. 12" x 18"—110 V. S.Ph. motor, 2 hp. Ser. R 5771. $600.00 fob.
SAND BLASTING TANK, Pangborn, model 1AV11. $150.00 fob.
SPHERICAL FURNACES, Romph Mfg., cap. up to 3000#.
SAND CUTTER, Am. model M.
Sly—TUMBLING BARRELS
DEGREASING UNITS—all sizes.
AIR TOOLS
FANS & BLOWERS—up to 125,000 CFM.
ELECTRIC FEED RAILS & TROLLEYS
FLASKS—Barnett & Pressed Steel.
HOISTS—electric, hand, air—1 to 10 ton.
CRANES—overhead & jib—all sizes.
MOTORS, SPEED REDUCERS, BLOWERS — any size.
GRINDING WHEELS—all sizes.
AIR COMPRESSORS—from 1 hp up.
TINNED CHAPLETS, approx. 22,000. ¼" Stem x ⅛" high x 1" square ends. 2 cents ea.
FOUNDRY EQUIPMENT. Send us your inquiries.

ALLIED MATERIALS HANDLING CO.
4657 SPRING GROVE CINCINNATI 32

FOR SALE
SAND BLAST EQUIPMENT

Pangborn Rotoblast cabinet, type ES-213. Used for cleaning propeller blade. Price 30% of list.
Pangborn Tumble Blast Barrels, Models 1GF Cap. 1 Cu. Ft; 2-GF 2½ Cu. Ft. Cap. Air type.
Wheelabrator 6' air table $1500.00.
Wheelabrator 15 x 20 tumblast complete with Dust Collector—$1500.
Wheelabrator 36 x 42 tumblast—$5000.
Wheelabrator #1 Tablast 4" dia. with tables and dust collector—$3250.
Sand Blast Cabinets, pressure-tanks, dust collectors and blowers.
Steel conveyor belt for 27 x 36 Wheelabrator tumblast. Like new—half price.
Crane—2-ton, twin hook—21' span—$400.00
Fork lift truck—1-ton $600.00.

DIAMOND SALES INC.
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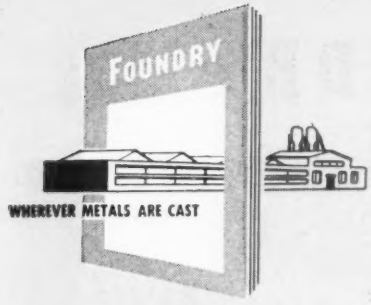

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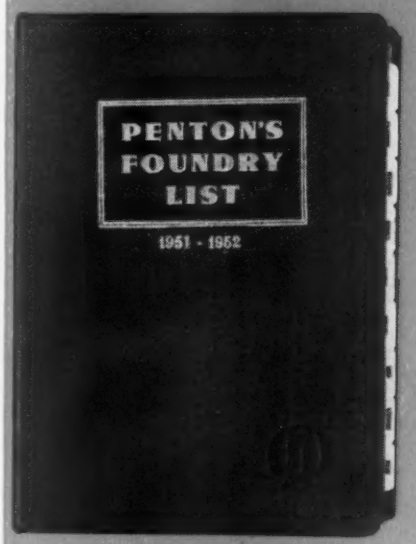

This volume helps you to know the foundry market thoroughly. The new 1951-52 Penton's foundry list provides you with the most complete information available anywhere on the 5,867 foundries in the U.S. and Canada. It tells *who* they *are*, *where* they are located, *what* they melt, how *big* they are and what departments they operate.

Many sales managers and buyers of castings say they could not get along without it. The price is reasonable. For descriptive literature, write to—

FOUNDRY

Book Department
Penton Publishing Company
Cleveland 13, Ohio

THOTS for today

from the FOUNDRY Business Staff

Formula for SUCCESS in selling—Frank Bettger suggests one which has been most helpful to those of us who have read his stimulating book entitled, "How I Raised Myself from Failure to Success in Selling." No. 1 principle, says Bettger, is *enthusiasm.*

Not reserved for the exclusive use of cheer leaders and vacuum cleaner salesmen, Bettger makes this interesting comment on enthusiasm (our "thot for today")—"Force yourself to act enthusiastic and you'll become enthusiastic. Make a high and holy resolve that you will double the amount of enthusiasm that you have been putting into your work and into your life. If you carry out that resolve, you will probably double your income, and double your happiness. *How can you begin?* There is just one rule: To become enthusiastic, ACT enthusiastic!

Speaking of enthusiasm, we were interested in the reaction of the ringside spectators throughout the furious 15-round fight of a fortnight or two ago when Billy Graham and Kid Gavilan mixed it up in the grand manner —so far as we could observe not a soul among the dozen or so we could see on our TV screen expressed an emotion or enthusiasm stronger than a group of spectators watching a fast game of dominoes. *The rest of the house was raising the roof.* How come, we wondered. Some of our selling is like that, 'tis sad to say . . . . inside of us is all kinds of enthusiasm and emotion for what we're selling but we just don't let ourselves "go" . . . . foundry business is GOOD. It's a fine time for becoming enthusiastic by ACTING enthusiastic. Let's try it on our next sales call.

We find ourselves referring more and more to the "dynamic" foundry industry—and some figures we've recently dug up illustrate how much more stature the foundry industry has than many of us realize. The Department of Commerce in its Census of Manufactures defines some 450 separate industry classifications. Two of these combine to reflect foundry productive output. In 1947 (the most recent year for which figures are available), the total value added by manufacture by all industry was $74,500,000,000. *The foundry industry alone among the 450 industries accounted for 2% of this grand total.*

Looking at the foundry industry from another angle, the total value of castings produced annually exceeds $3,000,000,000. Compare this with the value of products shipped in Petroleum Refining ($6,620,000,000), with Passenger Car production ($4,000,000,000), with Rubber tube-tire-footwear output ($2,700,000,000), with Lumber ($2,500,000,000), with Newspapers ($1,900,000,000). The identity of a casting is quickly lost yet the foundry industry IS a dynamic one and ranks high in our economy.

If you have a special interest in sizing up the foundry market, perhaps you would be interested in an up-to-date analysis of it which we have recently published for vendors and advertising agencies in 24-page booklet form.

Glossary of Foundry Terms—interest in this excellent 32-page booklet compiled by Metallurgical Editor, Ed Bremer, seems never to wane. We issued it as a service to FOUNDRY readers to begin with and again call attention to it with the offer to send a complimentary copy to anyone who can use it.

Geo. Dafter

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take advantage of these services of

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4. Gray Iron and Non-Ferrous Foundry—Man hours reduced from 86 to 57 after modernization and mechanization with total production increased 33%.

5. Jobbing Foundry—Malleable, Gray Iron, Non-Ferrous — Production increased 15%, manning decreased from 120 to 58, scrap reduced from 12 to 6%

* Names on request

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No job is too small—or too large—for Knight Foundry Engineers. Call our New York or Chicago office for immediate attention.

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ANOTHER FOUNDRY REPORTS

HOTTER METAL Thru MODERN Charging SAVES METAL... SPEEDS UP PRODUCTION OF THIN WALL PIPE...

*(1) MODERN 54" x 54" Weigh Hopper, normally mounted in a scale, is fully enclosed in the concrete pit. (2) All-welded, SMALL-CONE bucket is equipped with heavy-duty skip having dependable, safety locks. (3) Doors of the 54" x 54" bucket swung open to expose the SMALL-CONE which effectively levels the charge.

2" to 16", thin-wall pipe isn't the easiest pouring. But there is a one-best-way. Here at Buffalo Pipe & Foundry Company where a variety of thin, heavy pipe and fittings are made, MODERN charging methods are helping to melt hotter metal for this precision pouring. Waste is reduced! Quality of pipe is uniformly good! The MODERN truss-type charger swivels to serve either of the two number 11 cupolas. Behind the hoisting of the 54" x 54" SMALL-CONE bucket is a 30 H. P., gearhead motor.

*Small-Cone Side-Discharge

Uniform, side diffusion of metal over the full working area of the cupola improves operations in many foundries where this latest type, SMALL-CONE, MODERN charging bucket is used. Practical foundrymen everywhere report:

1. Wider diffusion of metal and coke maintains loose centers and compact sides . . .
2. The more level charge prevents shifting of large components . . .
3. Less air pressure is required and the softer blast penetrates the center of the charge . . .
4. Refractory burnout is reduced as much as 30%.
5. Coke ratios are lowered . . .
6. Hotter metal is tapped at the cupolas . . .

These and other advantages add up to a timely approach to improving quality, saving metal and reducing accidents.

Foundrymen who outline their planning problems on their company letterheads get all the details free! For catalogs and film-loan use the handy coupon . . .

MODERN EQUIPMENT CO.
PORT WASHINGTON, WISCONSIN

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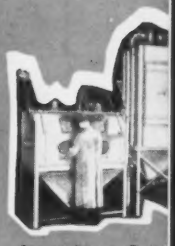
City ..... State .....

Headquarters *for* Foundry Equipment

Frederic B. Stevens, Inc., because of its position as one of the oldest and largest foundry suppliers, is enabled to *choose* the manufacturers of foundry equipment it wishes to represent as their sales agent, For this reason, you can depend on getting the best when you order foundry equipment through Stevens. The Stevens reputation for quality and fair dealing is your guarantee.

Stevens offers a complete and varied line of foundry equipment for every job. So call in your Stevens representative today and let him show you the complete catalog—over 600 pages—of the foundry equipment and supplies sold by Frederic B. Stevens, Inc. Or, if you prefer, write direct for full information.

Mulbaros



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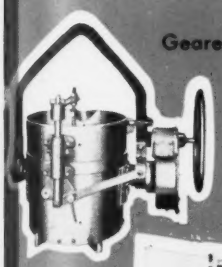

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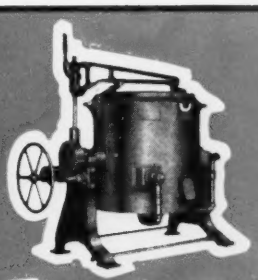

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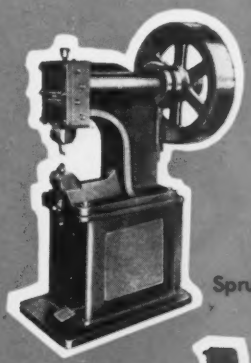

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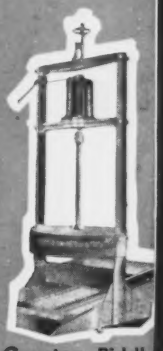
Stationary Melting Furnace



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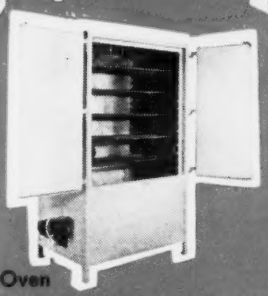

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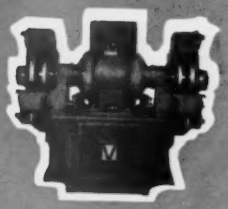
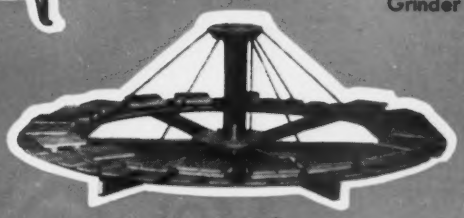
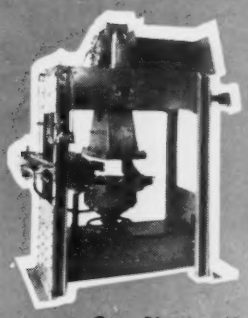


Grinder

Screenarator



Revolving Mold Conveyor



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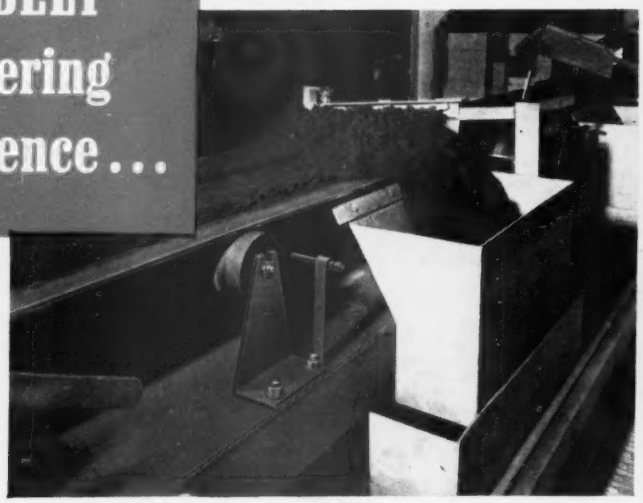
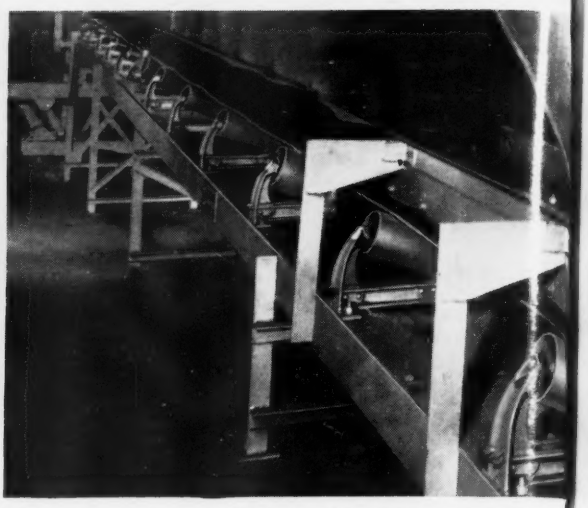
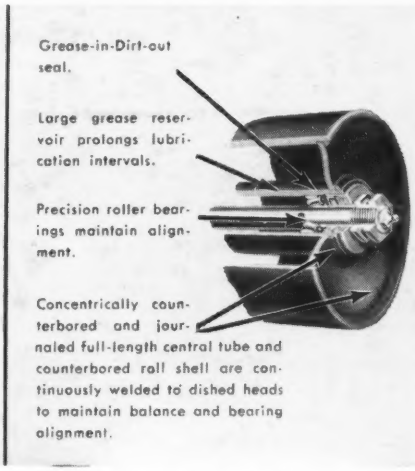




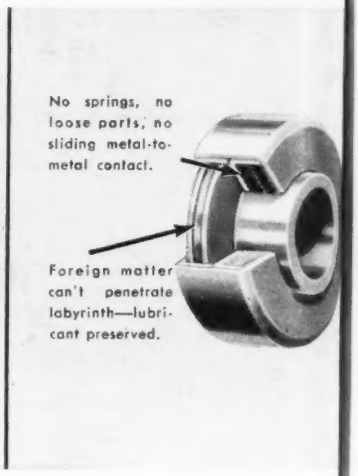
Left: Sand is distributed to molders' hoppers by means of Link-Belt Belt Conveyor employing flat roll idlers. *Right:* Spill-sand is carried on troughed conveyor in tunnel under line of molding machines.

plus LINK-BELT quality components...

Roller bearing L-B Flat Belt Idler.


Grease-in-Dirt-out seal.
Large grease reservoir prolongs lubrication intervals.
Precision roller bearings maintain alignment.
Concentrically counterbored and journaled full-length central tube and counterbored roll shell are continuously welded to dished heads to maintain balance and bearing alignment.

Less lubricant and adjustment.


No springs, no loose parts, no sliding metal-to-metal contact.
Foreign matter can't penetrate labyrinth—lubricant preserved.

Grease-in-Dirt-out Seal.

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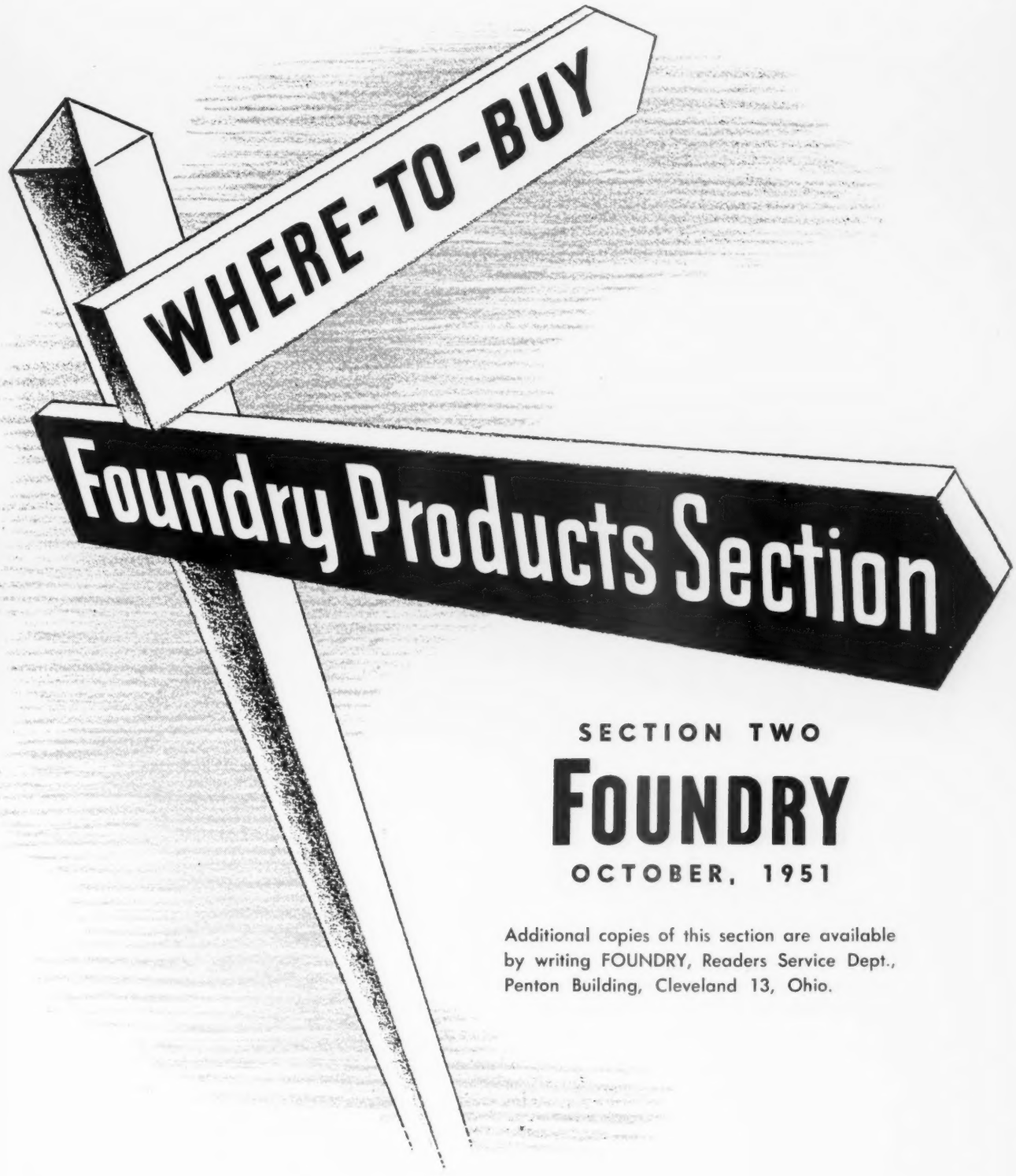

SECTION TWO

FOUNDRY

OCTOBER, 1951

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Electro Metallurgical Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.

CLAMPS (Flask)
Black, Sivalls & Bryson, Inc., 7500 E. 12th St., Kansas City 3, Mo.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa.
Shanafelt Mfg. Co., Canton, Ohio
Sterling Wheelbarrow Co., 1700 W. Walker St., Milwaukee 14, Wis.
Truscon Steel Co., Pressed Steel Div., 6100 Truscon Ave., Cleveland, Ohio.

CLAY (Bonding)
American Colloid Co., Merchandise Mart Plaza, Chicago 54, Ill.
Carpenter Brothers, Inc., 606 West Wisconsin 3, Mo.
Baroid Sales Division, 637 Railway Exchange Bldg., 80 East Jackson Blvd., Chicago 4, Ill.
Eastern Clay Products, Inc., Jackson, O.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Harbison-Walker Refractories Co., 1745 Farmers Bank Bldg., Pittsburgh 22, Pa.
Illinois Clay Products Co., Joliet, Ill.
Ironton Fire Brick Co., Ironton, O.

CLAY (Refractory)
Carpenter Brothers, Inc., 606 West Wisconsin 3, Mo.
Eastern Clay Products Inc., Jackson, O.
Harbison-Walker Refractories Co., 1745 Farmers Bank Bldg., Pittsburgh 22, Pa.
Illinois Clay Products Co., Joliet, Ill.

CLEANING COMPOUNDS
Hooker Electrochemical Co., Buffalo Ave. & 47th St., Niagara Falls, N. Y.
Pelron Corp., 7740 West 47th St., Lyons, Illinois

CLEANING EQUIPMENT
W. W. Sly Mfg. Co., 4753 Train Ave., Cleveland 2, Ohio

CLEANING EQUIPMENT (Castings)
American Wheelabrator & Equipment Co., 505 S. Byrkit St., Mishawaka, Ind.
Arrow Tools Inc., 1900 S. Kostner, Chicago, Ill.
Pangborn Corp., Hagerstown, Md.

CLUTCHES (Magnetic)
Dings Magnetic Separator Co., 4740 Electric Ave., Milwaukee 7, Wis.
Stearns Magnetic Mfg. Co., 622 S. 28th St., Milwaukee 4, Wis.

COKE (Foundry)
DeBardeleben Coal Corp., 2201 First Ave., N., Birmingham 3, Ala.

COKE (Foundry) (Cont'd.)
Hickman-Williams & Co., Union Commerce Bldg., Cleveland 14, O.
Philadelphia Coke Co., 4501 Richmond St., Philadelphia 37, Pa.
Pickands, Mather & Co., Cleveland 14, O.
Republic Coal & Coke Co., 8 So. Michigan Ave., Chicago 3, Ill.
Semet Solvay Div., Allied Chemical & Dye Corp., 40 Rector St., New York 6, N. Y.

COKE (Petroleum)
Republic Coal and Coke Co., 8 S. Michigan Ave., Chicago 3, Ill.

CONVERTER BLOWERS
Roots-Connersville Blower Corp., Connersville, Ind.

CONVERTERS (Bessemer)
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

CONVEYOR DESIGN
Giffels & Valet, Inc., Marquette Bldg., Detroit, Mich.

CONVEYORS (Belt)
Bartlett & Snow Co., C. O., 6201 Harvard Ave., Cleveland 5, O.
Beardsley & Piper Co., The, 2424 No. Cicero, Chicago 39, Ill.
Boston Woven Hose & Rubber Co., 29 Hampshire, Cambridge 39, Mass.
Imperial Belting Co., 1800 So. Kilbourn Ave., Chicago 23, Ill.
Jeffrey Mfg. Co., 907-99 N. Fourth St., Columbus 16, O.
Joy Mfg. Co., Joy Division, Pittsburgh, Pa.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
Logan Co., 580 Cabel, Louisville, Ky.
Mathews Conveyer Co., Ellwood City, Pa.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Newaygo Engineering Co., Newaygo, Mich.
Robins Conveyors Div., Hewitt-Robins Inc., 270 Passaic Ave., Passaic, N. J.
Standard Conveyor Co., North St. Paul 9, Minn.

CONVEYORS (Chain)
Jeffrey Mfg. Co., 907-99 N. Fourth St., Columbus 16, O.
Joy Mfg. Co., Joy Division, Pittsburgh, Pa.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
Logan Co., 580 Cabel, Louisville, Ky.
Mathews Conveyer Co., 104 Tenth St., Ellwood City, Pa.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Newaygo Engineering Co., Newaygo, Mich.
Richards-Wilcox Mfg. Co., Aurora, Ill.
Standard Conveyor Co., North St. Paul 9, Minn.

CONVEYORS (Gravity)
Logan Co., 580 Cabel, Louisville, Ky.
Mathews Conveyer Co., 104 Tenth St., Ellwood City, Pa.
Standard Conveyor Co., North St. Paul 9, Minn.

CONVEYORS (Live Roller)
Logan Co., 580 Cabel, Louisville, Ky.
Mathews Conveyer Co., Ellwood City, Pa.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Standard Conveyor Co., North St. Paul 9, Minn.

CONVEYORS (Magnetic)
Stearns Magnetic Mfg. Co., 662 S. 28th St., Milwaukee 4, Wis.

CONVEYORS (Monorail)
American Monorail Co., 13104 Athens Ave., Cleveland 7, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1155 E. 283rd St., Wickliffe, O.
Link-Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
Mathews Conveyer Co., 104 Tenth St., Ellwood City, Pa.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Penn Iron Works, Reading, Pa.
Richards-Wilcox Mfg. Co., Aurora, Ill.

CONVEYORS (Overhead)
Jeffrey Mfg. Co., 907 N. Fourth St., Columbus 16, O.
Link-Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
Mathews Conveyer Co., Ellwood City, Pa.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Richards-Wilcox Mfg. Co., Aurora, Ill.

CONVEYORS (Pneumatic)
Fuller Company, Catasauqua, Pa.

CONVEYORS (Portable)
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.

CONVEYORS (Portable-Gas Electric)
Joy Mfg. Co., Joy Division, Pittsburgh, Pa.
Link-Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.

CONVEYORS (Rubber)
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, O.
Standard Conveyor Co., North St. Paul 9, Minn.

CONVEYORS (Vibrating)
Ajax Flexible Coupling Co., Westfield, N. Y.
Jeffrey Mfg. Co., 907 N. Fourth St., Columbus 16, O.
Link-Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
Robins Conveyors Div., Hewitt-Robins Inc., 270 Passaic Ave., Passaic, N. J.
Simplicity Engineering Co., Durand, Mich.
Syntron Company, Homer City, Pa.

COPPER
Federated Metals Div., American Smelting and Refining Co., 120 Broadway, New York 5, N.Y.

COPPER SHOT
Federated Metals Div., American Smelting and Refining Co., 120 Broadway, New York 5, N.Y.
Niagara Falls Smelting & Refining Div., Continental-United Industries Co., Inc., 2204 Elmwood Ave., Buffalo 17, N. Y.

CORE BINDERS
American Gum Products Co., 500 Fifth Ave., New York 18, N. Y.
Archer-Daniels-Midland Co., Foundry Products Div., 2191 W. 110th St., Cleveland 2, O.
The Borden Company, 350 Madison Ave., New York 17, N. Y.
Bakelite Corp., 300 Madison Ave., New York 17, N. Y.
Cities Service Oil Co., 3200 S. Western Ave., Chicago 8, Ill.
Corn Products Sales Co., 17 Battery Pl., New York 4, N.Y.
Delta Oil Products Co., Milwaukee 9, Wis.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
General Electric Co., Pittsfield, Mass.

CORE BINDERS (Cont'd.)
Hercules Powder Co., Wilmington 99, Del.
E. F. Houghton Co., 303 W. Lehigh Ave., Philadelphia 33, Pa.
Chas. A. Krause Milling Co., 404 E. State St., Milwaukee 1, Wis.
Monsanto Chemical Co., Plastic Division, Springfield 2, Mass.
Pelron Corp., 7740 West 47th St., Lyons, Illinois
Robeson Process Co., 500 Fifth Ave., New York 18, N. Y.
Frederic B. Stevens, Inc., Detroit 16, Mich.
Werner G. Smith, Inc., 1730 Train Ave., Cleveland, Ohio.

CORE BLOWER BUSHINGS
Eastern Clay Products, Inc., Jackson, Ohio.
Martin Engineering Co., Kewanee, Ill.

CORE BLOWING MACHINES
Champion Foundry & Machine Co., 1553 W. Madison St., Chicago 7, Ill.
Wm. Demmler & Bros., Kewanee, Ill.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Harrison Machine Co., Wesleyville, Pa.
International Molding Machine Co., LaGrange Park, Ill.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, O.
Redford Iron & Equipment Co., 20733 Glendale Ave., Detroit 23, Mich.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.

CORE BOXES
Accurate Match Plate Co., 1847 W. Carroll St., Chicago, Ill.

CORE COLORING
Eaton Chemical & Dyestuff Co., 1490 Franklin, Detroit, Mich.

CORE COMPOUND
Archer-Daniels-Midland Co., Foundry Products Div., 2191 W. 110th St., Cleveland 2, O.
Bakelite Corp., 300 Madison Ave., New York 17, N. Y.
The Borden Company, 350 Madison Ave., New York 17, N. Y.
Cities Service Oil Co., 3200 S. Western Ave., Chicago 8, Ill.
Delta Oil Products Co., Milwaukee 9, Wis.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Pelron Corp., 7740 West 47th St., Lyons, Illinois.
Frederic B. Stevens, Inc., Detroit 16, Mich.
Werner G. Smith, Inc., 1730 Train Ave., Cleveland, Ohio.

CORE DRAWING MACHINES
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Freeman Supply Co., Toledo 5, O.

CORE DRIERS (Dielectric)
Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.

CORE FLUXES (Aluminum, Magnesium)
Pelron Corp., 7740 West 47th St., Lyons, Illinois.

CORE GRINDERS (Power Operated)
Jeffrey Mfg. Co., Columbus 16, O.

CORE GRINDERS (Power Operated) (Cont'd.)

Milwaukee Foundry Equipment Div., Spo Inc., 3328 Pierce St., Milwaukee 4, Wis.
Sutter Products Co., Dearborn, Mich.

CORE KNOCKOUT MACHINES

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
Beardsley & Piper Co., The, 2424 No. Cicero, Chicago 39, Ill.
Pangborn Corp., Hagerstown, Md.
Simplicity Engineering Co., Durand, Mich.

CORE MAKING MACHINES

Champion Foundry & Machine Co., 1553 W. Madison St., Chicago 7, Ill.
Davenport Machine & Foundry Co., Davenport, Iowa.
Wm. Demmler & Bros., Kewanee, Ill.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Harrison Machine Co., Wesleyville, Pa.
Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa.
International Molding Machine Co., LaGrange Park, Ill.
Milwaukee Foundry Equipment Div., Spo Inc., 3328 Pierce St., Milwaukee 4, Wis.
Redford Iron & Equipment Co., 20733 Glendale Ave., Detroit 23, Mich.
Sutter Products Co., Dearborn, Mich.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.
Wadsworth Equipment Co., 555 Lafollette St., Akron, Ohio.

CORE OILS

Archer-Daniels-Midland Co., Foundry Products Div., 2191 W. 110th St., Cleveland 2, O.
Cities Service Oil Co., 3200 S. Western Ave., Chicago 8, Ill.
Delta Oil Products Co., Milwaukee 9, Wis.
E. F. Houghton Co., 303 W. Lehigh Ave., Philadelphia 33, Pa.
Pelron Corp., 7740 West 47th St., Lyons, Illinois
Smith Oil & Refining Co., 1102 Kilburn Ave., Rockford, Ill.
Frederic B. Stevens, Inc., Detroit 26, Mich.
Werner G. Smith, Inc., 1730 Train Ave., Cleveland, Ohio.

CORE OVENS

Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, O.
Despatch Oven Co., Minneapolis 14, Minn.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, O.
Frederic B. Stevens, Inc., 18th St. & Vernor Highway, Detroit 16, Mich.
Girdler Corp., Thermex Division, 224 E. Broadway, Louisville 2, Ky.
Haynes Foundry Equipment Co., 814 Ada St., Kalamazoo, Mich.
Holcroft & Company, 6545 Epworth Blvd., Detroit 10, Mich.
Kirk & Blum Mfg. Co., Cincinnati 9, Ohio.
Lanly Company, 750 Prospect Ave., Cleveland 15, O.
Michigan Oven Co., 4500 Grand River Ave., Detroit 8, Mich.
Frederic B. Stevens, Inc., 18th St. & Vernor Highway, Detroit 16, Mich.

CORE PASTE

Corn Products Sales Co., 17 Battery Pl., New York 4, N. Y.
Delta Oil Products Co., Milwaukee 9, Wis.
Eastern Clay Products Co., Jackson, O.

CORE PASTE (Cont'd.)

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Frederic B. Stevens, Inc. 18th St. & Vernor Highway, Detroit 16, Mich.

CORE PLATES (Magnesium)

Christiansen Corp., 1515 No. Kilpatrick, Chicago 51, Ill.

CORE PLATES (Steel, Asbestos)

Black, Sivalls & Bryson, Inc., 7500 E. 12th St., Kansas City 6, Mo.
Industrial Fabricating, Inc., 817 Hall St., Eaton Rapids, Mich.
Johns-Manville, 22 E. 40th St., New York 16, N. Y.
Shanafelt Mfg. Co., 3623 Winfield Way, N.E., Canton 5, Ohio.
Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.
Truscon Steel Co., Pressed Steel Div., 6100 Truscon Ave., Cleveland, Ohio.

CORE ROD STRAIGHTENING and CUTTING MACHINERY

American Wheelabrator & Equipment Co., Mishawaka, Ind.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.

CORE SAND

American Silica Sand Co., Central Life Bldg., Ottawa, Ill.
Great Lakes Foundry Sand Co., United Artists Bldg., Detroit 26, Mich.
Nugent Sand Co., Muskegon, Mich.
Orefraction Inc., 7425 Thomas St., Pittsburgh 8, Pa.
Standard Silica Corp., 209 So. LaSalle St., Chicago 4, Ill.
Titanium Alloy Mfg. Div., National Lead Co., Hyde Park Blvd., Niagara Falls, N. Y.
Wedron Silica Co., 38 So. Dearborn St., Chicago, Ill.

CORE SAND MIXERS

American Wheelabrator & Equipment Co., 505 S. Byrkit St., Mishawaka, Ind.
Baker Perkins Inc., Saginaw, Mich.
Beardsley & Piper Co., The, 2424 No. Cicero, Chicago 39, Ill.
Standard Sand & Machine Co., Blystone Div., 549 W. Washington Blvd., Chicago 6, Ill.
Clearfield Machine Co., Clearfield, Pa.
Federal Foundry Supply Co., 4600 E. 71st St. Cleveland 5, Ohio.
Multiplex Machinery Corp., Elmore, Ohio.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Posey Iron Works Inc., Lancaster, Pa.
Royer Foundry & Machine Co., Kingston, Pa.

CORE SPRAYERS

Freeman Supply Co., 1152 East Broadway, Toledo, Ohio.

CORE STRIPPERS

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.

CORE TRAYS

Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.

CORE TRUCKS

Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.
Kirk & Blum Mfg. Co., Cincinnati 9, Ohio.
Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.

CORE VENTS

Demmler, Wm., & Bros., Kewanee, Ill.
Smillie, C. M. & Co., 1124 Woodward Heights Blvd., Ferndale 20, Mich.
United Compound Co., Inc., 328 South Park Ave., Buffalo 4, N. Y.

CORE WASH

Acheson Colloids Corp., Port Huron, Mich.
Carborundum Co., Perth Amboy, N. J.
Cities Service Oil Co., 3200 S. Western Ave., Chicago 8, Ill.
Corn Products Sales Co., 17 Battery Pl. New York City 4.
Delta Oil Products Co., Milwaukee 9, Wis.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
E. F. Houghton Co., 303 W. Lehigh Ave., Philadelphia 33, Pa.
National Carbon Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.
Smith Oil & Refining Co., 1102 Kilburn Ave., Rockford, Ill.
Stevens, Frederic B., Inc., Detroit 26, Mich.
Titanium Alloy Mfg. Div. National Lead Co., Hyde Park Blvd., Niagara Falls, N. Y.
United States Graphite Co., Saginaw, Mich.

CORE WIRES

Crescent Brass & Pin Co., 5766 Trumbull Ave., Detroit, Mich.

CORES (Annealing)

Pressed Steel Co., Wilkes-Barre, Pa.

CORES (Strainer) see STRAINER CORES

COUPLINGS (Air Line)

Cleco Division of Reed Roller Bit Co., Houston, Tex.
A. Schrader's Son 470 Vanderbilt Ave., Brooklyn 17, N. Y.

CRANE LUBRICATING SYSTEMS

Blaw-Knox Co., Farmers Bank Bldg., Pittsburgh, Pa.

CRANES (Bucket)

Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

CRANES (Electric Tramrail)

Chisholm-Moore Hoist Corp. and Columbus-McKinnon Chain Corp., Tonawanda, N. Y.

CRANES (Electric Traveling)

American MonoRail Co., 13104 Athens Ave., Cleveland 7, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1155 East 283rd St., Wickliffe, O.
Erie Steel Construction Co., Erie, Pa.
Shepard-Niles Crane & Hoist Corp., 360 Schuyler Ave., Montour Falls, N. Y.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

CRANES (Gantry)

Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, Ohio
Modern Equipment Co., Port Washington, Wis.
Wellman Engineering Co., 7000 Central Ave., Cleveland 4, Ohio

CRANES (Hand Traveling)

American MonoRail Co., 13104 Athens Ave., Cleveland 7, Ohio
Chisholm-Moore Hoist Corp. and Columbus-McKinnon Chain Corp., Tonawanda, N. Y.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1155 East 283rd St., Wickliffe, O.
Modern Equipment Co., Port Washington, Wis.
Shepard-Niles Crane & Hoist Corp. Montour Falls, N. Y.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

CRANES (Jib)

American MonoRail Co., 13104 Athens Ave., Cleveland 7, O.
Chisholm-Moore Hoist Corp. and Columbus-McKinnon Chain Corp., Tonawanda, N. Y.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, Ohio.
Modern Equipment Co., Port Washington, Wis.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

CRANES (Monorail)

American MonoRail Co., 13104 Athens Ave., Cleveland 7, O.
Chisholm-Moore Hoist Corp. and Columbus-McKinnon Chain Corp., Tonawanda, N. Y.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1155 East 283rd St., Wickliffe, O.
Modern Equipment Co., Port Washington, Wis.
Shepard-Niles Crane & Hoist Corp., 360 Schuyler Ave., Montour Falls, N. Y.

CRANES (Self-Propelled)

Coles Cranes Inc., P.O. Box 942, Joliet, Ill.
Silent Hoist & Crane Co., 835 63rd St., Brooklyn 20, N. Y.

CRAYONS (Marking)

Markal Co., 3052 W. Carroll, Chicago 12, Ill.

CRUCIBLES

American Crucible Co., North Haven, Conn.
Bay State Crucible Co., Taunton, Mass.
Electro Refractories & Abrasive Corp., Vars Bldg., Buffalo 2, N.Y.
Dixon, Joseph, Crucible Co., Jersey City, N. J.
Lava Crucible Co., Pittsburgh, Pa.
National Carbon Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.
National Crucible Co., Mermaid Lane and Queen Sts., Philadelphia 18, Pa.
Ross-Tacony Crucible Co., Tacony, Philadelphia, Pa.
Vesuvius Crucible Co., Swissvale, Pa.

CRUCIBLE FURNACES

Ajax Electrothermic Corp., Trenton, N. J.
Campbell-Hausfeld Co., Harrison, O.
Eclipse Fuel Engineering Co., 711 So. Main St., Rockford, Ill.
Lindberg Engineering Co., Fisher Furnace Div., 2450 West Hubbard, Chicago 12, Ill.

CRUCIBLE LIFTERS

Modern Equipment Co., Port Washington, Wis.

CRUCIBLE POURING DEVICES

Modern Equipment Co., Port Washington, Wis.

CRUSHERS (Core)

Newaygo Engineering Co., Newaygo, Mich.
Simplicity Engineering Co., Durand, Mich.

CUPOLAS

Foundry Service and Equipment Corp., Markham, Ill.
Modern Equipment Co., Port Washington, Wis.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

CUPOLA BLOWERS

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
Buffalo Forge Co, Buffalo, N. Y.
Roots-Connersville Blower Corp., Connersville, Ind.

CUPOLA BLOWERS (Cont'd.)

Spencer Turbine Co., Hartford, Conn.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

CUPOLA CHARGING MACHINES

American MonoRail Co., 13104 Athens Ave., Cleveland 7, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, O.
Foundry Service and Equipment Corp., Markham, Ill.
Modern Equipment Co., Port Washington, Wis.
Shepard-Niles Crane & Hoist Corp., Montour Falls, N. Y.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

CUPOLA CONTROL EQUIPMENT

Edwin S. Carman, 1643 Lee Road, Cleveland 18, Ohio.
Foxboro Company, Foxboro, Mass.

CUPOLA DUST ARRESTORS

Schneible Co., Claude B., 2827—25th St., Detroit 16, Mich.

CUPOLA LIGHTERS

Hickman-Williams Co., Union Commerce Bldg., Cleveland 14, Ohio.
Whiting Corp., Harvey, Ill.

CUPOLA LININGS

Carborundum Co., Perth Amboy, N. J.
Cleveland Quarries Co., 1740 E. 12th St., Cleveland 14, O.
General Refractories Co., 1520 Locust St., Philadelphia 2, Pa.
Ironton Fire Brick Co., Ironton, O.
United States Graphite Co., Saginaw, Mich.

CUPOLA PATCHING GUNS

Eastern Clay Products, Inc. Jackson, Ohio.

CUPOLA SPARK ARRESTORS

Claude B. Schneible Co., 2827 25th St., Detroit 16, Mich.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

CUTOFF MACHINES (Abrasive)

Fox Grinders Inc., Oliver Bldg., Pittsburgh, Pa.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.

CYLINDERS (Air)

Miller Motor Co., 2040 North Hawthorne, Melrose Park, Ill.

CYLINDERS (Hydraulic)

Miller Motor Co., 2040 North Hawthorne, Melrose Park, Ill.

DARK ROOM ACCESSORIES (X-Ray)

Eastman Kodak Co., Rochester, N. Y.
General Electric Co., X-Ray Dept., 4855 Electric Ave., Milwaukee 14, Wis.

DARK ROOM PROCESSING (Chemical Tanks, etc.)

Eastman Kodak Co., Rochester, N. Y.

DEGASIFIERS

Metalloy Corp., Rand Tower, Minneapolis 2, Minn.
Pittsburgh Metals Purifying Co., 1352 Marvista St., Pittsburgh 12, Pa.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
National Pigment Co., 2115 East York St., Philadelphia 25, Pa.
Niagara Falls Smelting & Refining Div., Continental-United Industries Co., Inc., 2204 Elmwood Ave., Buffalo 17, N. Y.

DEOXIDIZERS

Federated Metals Div., American Smelting and Refining Co., 120 Broadway, New York 5, N. Y.
Cleveland Flux Co., 1026 Main St., Cleveland 13, O.
Metalloy Corp., Rand Tower, Minneapolis 2, Minn.
National Pigment Co., 2115 East York St., Philadelphia 25, Pa.
Niagara Falls Smelting & Refining Div., Continental-United Industries Co., Inc., 2204 Elmwood Ave., Buffalo 17, N. Y.
Pittsburgh Metals Purifying Co., 1352 Marvista St., Pittsburgh 12, Pa.

DEOXIDIZERS (Ferrous)

Carborundum Co., Perth Amboy, N. J.

DESULPHURIZERS

American Silica Sand Co., Central Life Bldg., Ottawa, Ill.
Cleveland Flux Co., 1026 Main St., Cleveland 13, O.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Hercules Powder Co., Wilmington 99, Del.
Mathieson Chemical Corp., 60 Mathieson Bldg., Baltimore 3, Md.
Modern Equipment Co., Port Washington, Wis.
National Pigment Co., 2115 East York St., Philadelphia 25, Pa.
Pittsburgh Metals Purifying Co., 1352 Marvista St., Pittsburgh 12, Pa.
Solvay Sales Division Allied Chemical & Dye Corp., 40 Rector St., New York 6, N. Y.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

DIE CASTING MACHINES

Kux Machine Co., 3930 W. Harrison St., Shicago 24, Ill.
Miller-Taylor Tool Co., 5005 Euclid Ave., Cleveland 3, Ohio.

DIES

City Pattern Foundry & Machine Co., 1161 Harper, Detroit 11, Mich.

DOWEL PINS

Standard Horse Nail Corp., New Brighton, Pa.

DRILLS (Electric)

Mall Tool Co., 7720 So. Chicago Ave., Chicago 19, Ill.
Standard Electrical Tool Co., 2488 River Road, Cincinnati 4, Ohio.

DRILLS (Pneumatic)

Gardner-Denver Co., Quincy, Ill.
Mall Tool Co., 7720 So. Chicago Ave., Chicago 19, Ill.
Schramm Inc., West Chester, Pa.

DRUMS (Magnetic)

Dings Magnetic Separator Co., 4740 Electric Ave., Milwaukee 7, Wis.
Stearns Magnetic Mfg. Co., 662 S. 28th St., Milwaukee 4, Wis.

DUMP HOPPERS

Brummeler Steel Products Co., Grand Rapids, Mich.
Roura Iron Works, 1405 Woodland Ave., Detroit 11, Mich.

DUMP TRUCKS

Frank G. Hough Co., Libertyville, Ill.
Kwik-Mix Co., Port Washington Wis.
Prime Mover Co., Muscatine, Iowa.

DUST ARRESTING EQIUPMENT

American Air Filter Co., Inc. 266 Central Ave., Louisville 8, Ky.
American Wheelabrator & Equipment Co., Mishawaka, Ind.
Bartlett & Snow, C. O., Co., 6201 Harvard Ave., Cleveland 5, O.
Dracco Corp., 4063 East 116th St., Cleveland 5, Ohio.
Kirk & Blum Mfg. Co., Cincinnati 9, Ohio.
Pangborn Corp., Hagerstown, Md.
Schneible Co., Claude B., 2827—25th St., Detroit 16, Mich.
W. W. Sly Mfg. Co., 4753 Train Ave., Cleveland 2, Ohio.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

DUST COLLECTORS

American Wheelabrator & Equipment Co., Mishawaka, Ind.
American Air Filter Co., 266 Central Ave., Louisville 8, Ky.
Bartlett & Snow, C. O., Co., 6101 Harvard Ave., Cleveland, O.
Foundry Service and Equipment Corp., Markham, Ill.
Kirk & Blum Mfg. Co., Cincinnati 9, Ohio.
Pangborn Corp., Hagerstown, Md.
Claude B. Schneible Co., 2827 25th St., Detroit 16, Mich.
W. W. Sly Mfg. Co., 4753 Train Ave., Cleveland 2, Ohio.

DUST CONTROL (Chemical)

Dracco Corp., 4063 East 116th St., Cleveland 5, Ohio.

DUST RECOVERY SYSTEMS

American Wheelabrator & Equipment Co., Mishawaka, Ind.
Dracco Corp., 4063 East 116th St., Cleveland 5, Ohio.
Kirk & Blum Mfg. Co., Cincinnati 9, Ohio.
Pangborn Corp., Hagerstown, Md.

DYES & CHEMICALS

Eaton Chemical & Dyestuff Co., 1490 Franklin, Detroit, Mich.

ELECTRIC FURNACES (see Furnaces, Electric)

ELECTRODES (Graphite and Amorphous)

International Graphite & Electrode Corp., St. Marys, Pa.
National Carbon Co., Inc., Electrode Sales Div., 30 E. 42nd St., New York 17, N. Y.

ELEVATORS

Standard Conveyors Co., North St. Paul 9, Minn.

ELEVATORS (Bucket)

Bartlett & Snow Co., C. O., 6201 Harvard Ave., Cleveland 5, O.
Jeffrey Mfg. Co., Columbus 16, O.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Newaygo Engineering Co., Newaygo, Mich.
Robins Conveyors Div., Hewitt-Robins Inc., 270 Passaic Ave., Passaic, N. J.

ELEVATORS (Pneumatic, Material Handling)

Fuller Co., Catasauqua, Pa.

ENGINEERING SERVICE (Foundry)

Foundry Service & Equipment Corp., 16231 Turner Ave., Markham, Ill.
H. K. Ferguson, 1783 E. 11th St., Cleveland 14, Ohio.
Giffels & Vallet, Inc., Marquette Bldg., Detroit, Mich.
Lester B. Knight & Associates, Inc., 600 West Jackson Blvd., Chicago 3, Ill.

ENGINEERING SERVICE (Foundry) (Cont'd.)

A. H. Putnam Co., 1319 2nd Ave., Rock Island, Ill.
Westover Engineers, 3110 W. Fond du Lac Avenue, Milwaukee 10, Wis.

EXHAUST SYSTEMS

American Air Filter Co., Inc., Louisville 8, Ky.
American Wheelabrator & Equipment Co., Mishawaka, Ind.
Kirk & Blum Mfg. Co., Cincinnati 9, Ohio.
Pangborn Corporation, Hagerstown, Md.
Schneible Co., Claude B., 2827 25th St., Detroit 16, Mich.
W. W. Sly Mfg. Co., 4753 Train Ave., Cleveland 2, Ohio.

FABRICATORS (Metal)

Kirk & Blum Mfg. Co., Cincinnati 9, Ohio.
Newaygo Engineering Co., Newaygo, Mich.
Roura Iron Works, 1405 Woodland Ave., Detroit 11, Mich.

FACINGS

Acheson Colloids Corp., Port Huron, Mich.
Deta Oil Products Co., Milwaukee 9, Wis.
Joseph Dixon Crucible Co., Monmouth St., Jersey City, N. J.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5. O.
National Carbon Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.
Stevens Inc., Frederic B., Detroit 16, Mich.
United States Graphite Co., Saginaw, Mich.

FANS (Ventilating, Exhaust, Cooling, etc.)

American Wheelabrator & Equipment Co., Mishawaka, Ind.
Harvey P. Bertram Co., 1008 W. Ninth St., Cincinnati, Ohio
Hartzell Propeller Fan Co., Piqua, Ohio.
Joy Mfg. Co., La Del Division, New Philadelphia, Ohio.
Pangborn Corp., Hagerstown, Md.

FEEDERS (Rotary)

Fuller Company, Catasauqua, Pa.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
Newaygo Engineering Co., Newaygo, Mich.

FEEDERS (Sand)

Bartlett & Snow Co., C. O., 6201 Harvard Ave., Cleveland 5, O.
Jeffrey Mfg. Co., 907 N. Fourth St., Columbus 16, O.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
Newaygo Engineering Co., Newaygo, Mich.

FERROBORON

Electro Metallurgical Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.
Molybdenum Corp. of America, Pittsburgh 19, Pa.

FERROCHROME

Electro Metallurgical Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.
Hickman-Williams & Co., Cleveland, O.
Ohio Ferro-Alloys Corp., Canton 2, O.
Vanadium Corp., of America, 420 Lexington Ave., New York, N. Y.

FERROCOLUMBIUM

Electro Metallurgical Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.

FERROMANGANESE

Electro Metallurgical Div. Union Carbide & Carbon Corp. 30 E. 42nd St., New York 17, N. Y.

Ohio Ferro-Alloys Corp. Canton 2, O.

FERROMOLYBDENUM

Molybdenum Corporation of America, Pittsburgh 19, Pa.

FERROSILICON

Electro Metallurgical Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.

Jackson Iron & Steel Co., Jackson, O.

Keokuk Electro Metals Co., 429 So. 4th St., Keokuk, Iowa.

Miller & Company, 332 S. Michigan Ave., Chicago 4, Ill.

Ohio Ferro-Alloys Corp., Canton 2, O.

Vanadium Corp. of America, 420 Lexington Ave., New York, N. Y.

FERROTITANIUM

Electro Metallurgical Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.

Titanium Alloy Mfg. Div. National Lead Co., Hyde Park Blvd., Niagara Falls, N. Y.

Vanadium Corp. of America, 420 Lexington Ave., New York, N. Y.

FERROTUNGSTEN

Electro Metallurgical Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.

Molybdenum Corp. of America, Pittsburgh 19, Pa.

FERROVANADIUM

Electro Metallurgical Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.

Vanadium Corp. of America, 420 Lexington Ave., New York, N. Y.

FILES (Rotary)

Bassett Rotary File & Saw Co., 548 North Cicero, Chicago 44, Ill.

FILLET (Leather)

Milwaukee Leather Belting Co., 1114 No. Water St., Milwaukee, Wis.

FILM (X-Ray)

Eastman Kodak Co., Rochester, N. Y.

General Electric Co., X-Ray Dept., 4855 Electric Ave., Milwaukee 14, Wis.

FILTERS (Air)

American Air Filter Co., 266 Central Ave., Louisville 8, Ky.

FIRE BRICK

Babcock & Wilcox Co., 85 Liberty St., New York 6, N. Y.

Carborundum Co., Perth Amboy, N. J.

Electro Refractories & Abrasive Corp., Vars Bldg., Buffalo 2, N.Y.

General Refractories Co., 1520 Locust St., Philadelphia 2, Pa.

Harbison-Walker Refractories Co., 1745 Farmers Bank Bldg., Pittsburgh 22, Pa.

FIRE BRICK (Con't.)

Illinois Clay Products Co., Joliet, Ill.

Norton Co., Worcester 6, Mass.

Stevens Inc., Frederic B., Detroit 16, Mich.

FIRE CLAY

Eastern Clay Products, Inc., Jackson, O.

General Refractories Co., 1520 Locust St., Philadelphia 2, Pa.

Harbison-Walker Refractories Co., 1745 Farmers Bank Bldg., Pittsburgh 22, Pa.

Illinois Clay Products Co., Joliet, Ill.

Ironton Fire Brick Co., Ironton, O.

FIRE SAND

Carborundum Co., Niagara Falls, N. Y.

Cleveland Quarries Co., 1740 E. 12th St., Cleveland 14, O.

FIRESTONE

Cleveland Quarries Co., 1740 E. 12th St., Cleveland 14, O.

FLASK BANDS

Chicago Mfg. & Distributing Co., 1928 W. 16th St., Chicago 9, Ill.

Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.

FLASK BUSHINGS

Black, Sivalls & Bryson, Inc., 7500 E. 12th St., Kansas City 6, Mo.

Hines Flask Co., 3431 W. 140 St., Cleveland 11, Ohio.

Shanafelt Mfg. Co., 3623 Winfield Way, N. E., Canton 5, Ohio.

Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.

Universal Engineering Co., Frankenmuth, Mich.

FLASK PINS

Black, Sivalls & Bryson, Inc., 7500 E. 12th St., Kansas City 6, Mo.

Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.

Shanafelt Mfg. Co., 3623 Winfield Way, N. E., Canton 5, Ohio.

Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.

Universal Engineering Co., Frankemuth, Mich.

V-G Flask & Fitting Co., Box 467, Madison, Conn.

FLASKS (Aluminum, Magnesium)

Adams Co., Dubuque, Iowa.

Fremont Flask Co., Fremont, O.

Hines Flask Co., 3431 W. 140th St., Cleveland 11, O.

FLASKS (Dowmetal)

Fremont Flask Co., Fremont, O.

Hines Flask Co., 3431 W. 140th St., Cleveland 11, O.

FLASK FILLERS

Bartlett & Snow, C. O., Co., 6201 Harvard Ave., Cleveland 5, O.

Beardsley & Piper Co., 2424 No. Cicero, Chicago 39, Ill.

Jeffrey Mfg. Co., Columbus 16, O.

FLASKS (Slip)

Adams Co., Dubuque, Iowa.

Freeman Supply Co., 1152 East Broadway, Toledo, Ohio.

FLASKS (Slip) (Con't.)

Fremont Flask Co., Fremont, O.

Hines Flask Co., 3431 W. 140th St., Cleveland 11, O.

Industrial Fabricating, Inc., 817 Hall St., Eaton Rapids, Mich.

FLASKS (Snap)

Adams Co., Dubuque, Iowa.

Fremont Flask Co., Fremont, O.

Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.

Stevens, Inc., Frederic B., Detroit 16, Mich.

V-G Flask & Fitting Co., Box 467, Madison, Conn.

FLASKS (Steel)

Black, Sivalls & Bryson, Inc., 7500 E. 12th St., Kansas City 6, Mo.

Industrial Fabricating, Inc., 817 Hall St., Eaton Rapids, Mich.

Shanafelt Mfg. Co., 3623 Winfield Way, N. E., Canton 5, Ohio.

Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.

Truscon Steel Co., Pressed Steel Div., 6100 Truscon Ave., Cleveland, Ohio.

FLASK FITTINGS

Adams Co., Dubuque, Iowa.

Black, Sivalls & Bryson, Inc., 7500 E. 12th St., Kansas City 6, Mo.

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.

Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.

Shanafelt Mfg. Co., 3623 Winfield Way, N. E., Canton 5, Ohio.

Truscon Steel Co., Pressed Steel Div., 6100 Truscon Ave., Cleveland, Ohio.

V-G Flask & Fitting Co., Box 467, Madison, Conn.

FLASK LIFT MACHINES

Beardsley & Piper Co., 2424 No. Cicero, Chicago 39, Ill.

Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.

FLASK LUMBER

Dougherty Lumber Co., 4300 E. 66th St., Cleveland 5, O.

Rietz Lumber Co., 1810 N. Central Park Ave., Chicago, Ill.

FLASKS (Wood)

Adams Co., Dubuque, Iowa.

Chicago Mfg. & Distributing Co., 1928 W. 16th St., Chicago 9, Ill.

V-G Flask & Fitting Co., Box 467, Madison, Conn.

FLEXIBLE COUPLINGS

Ajax Flexible Coupling Co., Westfield, N. Y.

FLOORING

Norton Co., Worcester 6, Mass.

Walter Maguire Co. Inc., 60 East 42nd St., New York 17, N. Y.

FLOOR RESURFACER

Monroe Co., 10703 Quebec St., Cleveland 6, Ohio

FLUXES

Apex Smelting Co., 2537 West Taylor St., Chicago 12, Ill.

Atlantic Chemical & Metals Co., 1925 N. Kenmore, Chicago 14, Ill.

Cleveland Flux Co., 1026 Main St., Cleveland 13, O.

Mathieson Chemical Corp., Mathieson Bldg., Baltimore 3, Md.

National Pigment Co., 2115 East York St., Philadelphia 25, Pa.

Niagara Falls Smelting & Refining Div., Continental-United Industries Co., Inc., 2204 Elmwood Ave., Buffalo 17, N. Y.

FLUXES (Cont'd.)

Pittsburgh Metals Purifying Co., 1352 Marvista St., Pittsburgh 12, Pa.

Puro-Seal Co., 2323 West Third, Cleveland 13, Ohio.

Rossborough Supply Co., 3376 West 137th St., Cleveland, Ohio

FLUXES (Soldering, Welding & Tinning)

Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y.

FOUNDRY ENGINEERS

Edwin S. Carman, 1643 Lee Road Cleveland 18, Ohio.

Lester B. Knight & Associates Inc., 600 West Jackson Blvd., Chicago 3, Oll.

A. A. Wickland Co., 205 W. Wacker Dr., Chicago 6, Ill.

FOUNDRY LAYOUT & METHODS

H. K. Ferguson Co. 1783 E. 11th St., Cleveland 14, Ohio.

Giffels & Vallet, Inc., Marquette Bldg., Detroit, Mich

Lester B. Knight & Associates, Inc 600 West Jackson Blvd., Chicago 3, Ill.

FOUNDRY NAILS

Crescent Brass & Pin Co., 5766 Trumbull Ave., Detroit, Mich

Standard Horse Nail Corp., New Brighton, Pa.

FOUNDRY SHOVELS
(See SHOVELS)

FOUNDRY SUPPLIES

Rossborough Supply Co., 3376 West 137th St., Cleveland, Ohio

FOUNDRY SUPPLY HOUSES

Combined Supply & Equipment Co., Inc., 215 Chandler St., Buffalo 7, N. Y.

Eastern Clay Products, Inc., Jackson, Ohio

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.

Foundries Materials Co., Coldwater, Mich.

Stevens, Inc., Frederic B., Detroit 16, Mich.

FURNACES (Aluminum & Magnesium Billets)

Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.

Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.

FURNACES (Aluminum & Magnesium Forgings)

Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.

Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.

FURNACES (Aluminum Melting)

Ajax Engineering Corp., Trenton, N. J.

Cambell-Hausfeld Co., Harrison, O.

Eclipse Fuel Engineering Co., 711 So. Main St., Rockford, Ill.

FURNACES (Aluminum Rivet Heating)

Ajax Electric Co., Inc., Philadelphia 23, Pa.

FURNACES (Annealing)

Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.

Despatch Oven Co., Minneapolis 14, Minn.

FURNACES (Annealing) (Cont'd.)

Eclipse Fuel Engineering Co., 711 So. Main St., Rockford, Ill.
Electric Furnace Co., West Wilson St., Salem, Ohio.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.
Holcroft & Company, 6545 Epworth Blvd., Detroit 10, Mich.
Lindberg Engineering Co., Fisher Furnace Div., 2450 West Hubbard, Chicago 12, Ill.

FURNACES (Crucible Melting)

Ajax Eltrothermic Corp., Trenton, N. J.
Campbell-Hausfeld Co., 300-320 Moore St., Harrison, O.
Lindberg Engineering Co., Fisher Furnace Div., 2450 West Hubbard, Chicago 12, Ill.
Stroman Furnace & Engineering Co., Div. of Peterson Oven Co., 9900 Franklin Ave., Franklin Park, Ill.

FURNACES (Electric Melting)

Ajax Electric Furnace Corp., 46 Richmond St., Philadelphia 23, Pa.
Ajax Electrothermic Corp., Trenton, N. J.
Ajax Engineering Corp., Trenton, N. J.
American Bridge Co., Pittsburgh 19, Pa.
Detroit Electric Furnace Div. of Kuhlman Electric Co., Bay City, Mich.
Pittsburgh Lectromelt Furnace Corp., P.O. Box 1125, Pittsburgh, Pa.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

FURNACES (Gas or Oil Fired)

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
Campbell-Hausfeld Co., Harrison, O.
Carl-Mayer Corp., 3030 Euclid Ave. Cleveland 15, Ohio.
Eclipse Fuel Engineering Co. 711 So. Main St., Rockford, Ill.
Electric Furnace Co., West Wilson St., Salem, Ohio.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.
Lanly Company, 750 Prospect Ave., Cleveland 15, Ohio.
Lindberg Engineering Co., Fisher Furnaces Div., 2450 West Hubbard, Chicago 12, Ill.
Reda Pump Co., Bartlesville, Okla.
Stroman Furnace & Engineering Co., Div. of Peterson Oven Co., 9900 Franklin Ave., Franklin Park, Ill.

FURNACES (Gray Iron Melting)

American Bridge Co., Pittsburgh 19, Pa.
Detroit Electric Furnace Div. of Kuhlman Electric Co., Bay City, Mich.
Pittsburgh Lectromelt Furnace Corp., P.O. Box 1125, Pittsburgh Pa.
Reda Pump Co., Bartlesville, Oklahoma

FURNACES (Heat Treating)

Ajax Electric Co., Inc., Philadelphia 23, Pa
Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio
Despatch Oven Co., Minneapolis 14, Minn.
Eclipse Fuel Engineering Co., 711 So. Main St., Rockford, Ill.
Electric Furnace Co., West Wilson St. Salem, Ohio.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.
Holcroft & Company, 6545 Epworth Blvd., Detroit 10, Mich.
Lindberg Engineering Co., Fisher Furnace Div., 2450 West Hubbard, Chicago 12, Ill.

FURNACES, HEAT TREATING (Electric)

Ajax Electric Co., Inc., Philadelphia 23, Pa.
Ajax Electrothermic Corp., Trenton, N. J.
Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Despatch Oven Co., Minneapolis 14, Minn.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.

FURNACES (Induction Heating)

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.

FURNACES (Malleable Annealing)

Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Electric Furnace Co., West Wilson St., Salem, Ohio.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.
General Electric Co., Schenectady, N. Y.
Holcroft & Company, 6545 Epworth Blvd., Detroit 10, Mich.
Lindberg Engineering Co., Fisher Furnace Div., 2450 West Hubbard, Chicago 12, Ill.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

FURNACES (Malleable Melting)

American Bridge Co., Pittsburgh 19, Pa.
Pittsburgh Lectromelt Furnace Corp., P.O. Box 1125, Pittsburgh, Pa.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

FURNACES (Nonferrous Melting)

Ajax Electrothermic Corp., Trenton, N. J.
Ajax Engineering Corp., Trenton, N. J.
Campbell-Hausfeld Co., Harrison, O.
Detroit Electric Furnace Div. of Kuhlman Electric Co., Bay City, Mich.
Eclipse Fuel Engineering Co., 711 So. Main St., Rockford, Ill.
Lindberg Engineering Co., Fisher Furnace Div., 2450 West Hubbard, Chicago 12, Ill.
Reda Pump Co., Bartlesville, Oklahoma
Stroman Furnace & Engineering Co., Div. of Peterson Oven Co., 9900 Franklin Ave., Franklin Park, Ill.

FURNACES (Powdered Coal)

Foundry Service and Equipment Corp., Markham, Ill.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

FURNACES (Steel Melting)

Ajax Electrothermic Corp., Trenton, N. J.
American Bridge Co., Pittsburgh 19, Pa.
Detroit Electric Furnace Div. of Kuhlman Electric Co., Bay City, Mich.
Pittsburgh Lectromelt Furnace Corp., P.O. Box 1125, Pittsburgh, Pa.

FURNACE BLOWERS

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
Campbell-Hausfeld Co., Harrison, O.
Joy Mfg. Co., La-Del Division, New Philadelphia, Ohio.
Lindberg Engineering Co., Fisher Furnace Div., 2450 West Hubbard, Chicago 12, Ill.
Roots-Connersville Blower Corp., Connersville, Ind.

FURNACE LININGS

Campbell-Hausfeld Co., Harrison, O.
Carborundum Co., Perth Amboy, N. J.
Electro Refractories & Abrasive Corp., Vars Bldg., Buffalo 2, N.Y.
Ironton Fire Brick Co., Ironton, O.
Lindberg Engineering Co., Fisher Furnace Div., 2450 West Hubbard, Chicago 12, Ill.
National Carbon Co. Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.
Stroman Furnace & Engineering Co., Div. of Peterson Oven Co., 9900 Franklin Ave., Franklin Park, Ill.
Titanium Alloy Mfg. Div., National Lead Co., Hyde Park Blvd., Niagara Falls, N. Y.
United States Graphite Co., Saginaw, Mich.

GAGGERS

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Wadsworth Equipment Co., 555 Lafollette St., Akron, Ohio.

GAS (Oxygen, Acetylene, Industrial)

Air Reduction Sales Co., 60 East 42nd St., New York 17, N. Y.
Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y.

GAS BURNERS

Lindberg Engineering Co., Fisher Furnace Div., 2450 West Hubbard St., Chicago 12, Ill.

GENERATORS (Acetylene)

Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y.

GLOVES (Industrial, Safety)

American Optical Co., Southbridge, Mass.
United States Rubber Co., 4300 New Haven Ave., Ft. Wayne 4, Ind.

GOGGLES and EYE PROTECTORS

American Optical Co., Southbridge, Mass.
B. F. McDonald Co., 5721 West 96th St., Los Angeles 37, Calif.
Willson Products Inc., Reading, Pa.

GRAPHITE

Acheson Colloids Corp., Port Huron, Mich.
Joseph Dixon Crucible Co., Monmouth St., Jersey City, N. J.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
International Graphite & Electrode Corp., St. Marys, Pa.
National Carbon Co. Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.
United States Graphite Co., Saginaw, Mich.

GRAPHITIZER

United States Graphite Co., Saginaw, Mich.

GRINDERS (Electric Portable)

Chicago Pneumatic Tool Co., 6 East 44th St., New York 17, N. Y.
Independent Pneumatic Tool Co., Aurora, Ill.
Mall Tool Co., 7720 So. Chicago Ave., Chicago 19, Ill.
Rotor Tool Co., 17325 Euclid Ave., Cleveland 12, Ohio.

GRINDERS (Electric Portable) (Cont'd.)

Standard Electrical Tool Co., 2488 River Road, Cincinnati 4, Ohio.

GRINDERS (Flexible Shaft)

Mall Tool Co., 7720 So. Chicago Ave., Chicago 19, Ill.

GRINDERS (Hand)

Chicago Wheel & Mfg. Co., 1101 W. Monroe, Chicago 7, Ill.

GRINDERS (Pneumatic Portable)

Chicago Pneumatic Tool Co., 6 East 44th St., New York 17, N. Y.
Cleco Pneumatic Tool Div., Reed Roller Bit Co., Houston, Tex.
Independent Pneumatic Tool Co., Aurora, Ill.
Master Pneumatic Tool Co., Inc., Orwell, Ohio.
Rotor Tool Co., 17325 Euclid Ave., Cleveland 12, Ohio.

GRINDERS (Surface, Bench, Disc, Floor)

Bradford Machine Tool Co., 659 Evans St., Cincinnati, Ohio
Fox Grinders, Inc., Oliver Bldg., Pittsburgh 22, Pa.
Independent Pneumatic Tool Co., Aurora, Ill.
Standard Electrical Tool Co., 2488 River Road, Cincinnati 4, Ohio.

GRINDERS (Swing Frame)

Fox Grinders, Inc., Oliver Bldg., Pittsburgh 22, Pa.
Sutter Products Co., Dearborn, Mich.

GRINDING WHEELS—See ABRASIVE WHEELS

GRINDING WHEEL DRESSERS

Carborundum Co., Niagara Falls, N. Y.
Desmond-Stephens Mfg. Co., Urbana, O.

GRINDSTONES

Cleveland Quarries Co., 1740 E. 12th St., Cleveland 14, Ohio
Bay State Abrasive Products Co., Westboro, Mass.
Sterling Grinding Wheel Division, Cleveland Quarries Co., Tiffin, Ohio

GRIT (Abrasive)

Alloy Metal Abrasive Co., Ann Arbor, Mich.
American Steel Abrasives Co., Galion, O.
American Wheelabrator & Equipment Co., Mishawaka, Ind.
Carborundum Co., Niagara Falls, N. Y.
Clayton Sherman Abrasives Co., 3896 Lonyo Rd., Detroit 10, Mich.
Cleveland Metal Abrasive Co., 887 E. 67th St., Cleveland, Ohio.
Hickman-Williams & Co., Union Commerce Bldg., Cleveland 14, O.
Metal Blast, Inc., 871 E. 67th St., Cleveland, Ohio.
Pangborn Corp., Hagerstown, Md.
Pittsburgh Crushed Steel Co., Pittsburgh 1, Pa.

HAMMERS (Chipping)

Arrow Tools Inc., 1900 S. Kostner, Chicago, Ill.
Chicago Pneumatic Tool Co., 6 East 44th St., New York 17, N. Y.

HAMMERS (Chipping) Cont'd.)

Cleco Pneumatic Tool Div., Reed Roller Bit Co., Houston, Texas.
Dayton Pneumatic Tool Co., Dayton 1, Ohio.
Independent Pneumatic Tool Co., Aurora, Ill.
Joy Mfg. Co., Sullivan Division, Michigan City, Ind.
Master Pneumatic Tool Co., Inc., Orwell, Ohio.
Schramm Inc., West Chester, Pa.

HARDNESS TESTING EQUIPMENT

Detroit Testing Machine Co., 19390 Grinnell Ave., Detroit 13, Mich.
Harry W. Dietert Co., 9330A Roselawn Ave., Detroit 4, Mich.
Foxboro Company, Foxboro, Mass.
Illinois Testing Laboratories, Inc. 418 N. LaSalle St., Chicago 10, Ill.

HEAT CONTROL AND RECORDING DEVICES

Claude S. Gordon Co. 3000 So. Wallace, Chicago 16, Ill.
Lindberg Engineering Co., Fisher Furnace Div., 2450 West Hubbard, Chicago 12, Ill.
Marshall Co., L. H., 270 W. Lane, Columbus 1, O.

HEATERS (Gas, Oil, Electric)

American Wheelabrator & Equipment Co., Mishawaka, Ind.
Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.
Lanly Co., 750 Prospect Ave., Cleveland 15, Ohio.

HEATERS (High Frenquency Electric)

Ajax Electrothermic Corp., Trenton, N. J.

HEATERS (Indirect Fired)

Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.

HEATERS (Space, Unit, Direct Fired)

Dravo Corp., Neville Island, Pittsburgh 25, Pa.

HEATERS (Space, Unit, Oven, Water)

American Wheelabrator & Equipment Co., Mishawaka, Ind.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.

HELMETS (Blasting)

American Wheelabrator & Equipment Co., Mishawaka, Ind.
American Optical Co., Southbridge, Mass.
B. F. McDonald Co., 5721 West 96th St., Los Angeles 37, Calif.
Pangborn Corp., Hagerstown, Md.
W. W. Sly Mfg. Co., 4753 Train Ave., Cleveland 2, Ohio.

HELMETS (Welding)

American Optical Co., Southbridge, Mass.

HOISTS (Air)

Chicago Pneumatic Tool Co., 6 East 44th St., New York 17, N. Y.
Curtis Pneumatic Machinery Div. Curtis Mfg. Co., 1943 Kienlen Ave., St. Louis 20, Mo.
Gardner-Denver Co., Quincy, Ill.
Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.
Joy Mfg. Co., Sullivan Division, Michigan City, Ind.
Miller Motor Co., 2040 North Hawthorne, Melrose Park, Ill.

HOISTS (Chain)

Chisholm-Moore Hoist Corp. and Columbus-McKinnon Chain Corp., Tonawanda, N. Y.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1155 East 283rd St., Wickliffe, O.

HOISTS (Electric)

Chisholm-Moore Hoist Corp. and Columbus-McKinnon Chain Corp., Tonawanda, N. Y
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1155 East 283rd St., Wickliffe, O.
Joy Mfg. Co., Sullivan Division, Michigan City, Ind.
Modern Enquipment Co., Port Washington, Wis.
Shepard-Niles Crane & Hoist Corp., Montour Falls, N. Y.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

HOISTS (Hand)

Chisholm-Moore Hoist Corp. and Columbus-McKinnon Chain Corp., Tonawanda, N. Y.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, Ohio.

HOISTS (Skip)

Beardsley & Piper Co., The, 2424 No. Cicero, Chicago 39, Ill.
Gardner-Denver Co., Quincy, Ill.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Newaygo Engineering Co., Newaygo, Mich.
Robins Conveyors Div., Hewitt-Robins Inc., 270 Passaic Ave., Passaic, N. J.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

HOODS (Shakeout, Pouring & Cooling)

Claude B. Schneible Co., 2827 25th St., Detroit 16, Mich.

HOPPERS (Sand)

Industrial Fabricating, Inc., 817 Hall St., Eaton Rapids, Mich.

HOSE (Air, Blasting, Water, Gas)

Boston Woven Hose & Rubber Co., 29 Hampshire, Cambridge 39, Mass.
Gardner-Denver Co., Quincy, Ill.
Hewitt Rubber Div. Hewitt-Robins Div., Inc., 240 Kensington Ave., Buffalo 5, N. Y.
Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.
Pangborn Corp., Hagerstown, Md.
Raybestos-Manhattan, Inc., Manhattan Rubber Div., Passaic, N. J.
Schramm Inc., West Chester, Pa.

HOSE FITTINGS

Boston Woven Hose & Rubber Co., 29 Hampshire, Cambridge 39, Mass.
A. Schrader's Son, 417 Vanderbilt Ave., Brooklyn 17, N. Y.

HOSE REELS

A. Schrader's Son, 470 Vanderbilt Ave., Brooklyn 17, N. Y.

HYDRAULIC CLEANING EQUIPMENT

Pangborn Corp., Hagerstown, Md.

HYDRO FINISHING EQUIPMENT

Pangborn Corp., Hagerstown, Md.

IDENTIFICATION PENCILS

Markal Co., 3052 W. Caroll, Chicago 12, Ill.

ILLUMINATORS (X-Ray Films)

Eastman Kodak Co., Rochester, N. Y.

IMPREGNATING SYSTEMS

Empire Varnish Co., 2636 E. 76th St., Cleveland 4, O.
Tincher Products Co., Sycamore 12, Ill.

INDUSTRIAL ENGINEERING SERVICE

Lester B. Knight & Associates, Inc., 600 West Jackson Blvd., Chicago 3, Ill.

INGOT MOLDS

Acme Foundry Co., Detroit 16, Mich.
National Carbon Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.

INGOTS (Magnesium)

Christiansen Corp., 1515 No. Kilpatrick, Chicago

INGOTS (Nonferrous)

Apex Smelting Co., 2537 West Taylor St., Chicago 12, Ill.
Belmont Smelting & Refining Works, 330 Belmont Ave., Brooklyn, N.Y.
Christiansen Corp., 1515 No. Kilpatrick, Chicago 51, Ill.
Federated Metals Div. of American Smelting and Refining Co., 120 Broadway, New York 5.
Frontier Bronze Corp., 818 Elmwood Ave., Niagara Falls, N. Y.
International Nickel Co., Inc., 67 Wall St., New York City 5.
Kaiser Aluminum & Chemical Corp., Kaiser Bldg., Oakland, Calif.
R. Lavin & Sons Inc., 3426 So. Kedzie Ave., Chicago 23, Ill.
Rossborough Supply Co., 3376 West 137th St., Cleveland, Ohio
Sonken-Galamba Corp., Kansas City 18, Kansas.
Western Metals Co., 3201 So. Kedzie Ave., Chicago 23, Ill.

INOCULANTS

Carborundum Co., Perth Amboy, N. J.
United States Graphite Co., Saginaw, Mich.

IRON CEMENT

Smooth-On Mfg. Co., 570 Communipaw Ave., Jersey City 4, N. J.

IRON ORE

Pickands, Mather & Co., Cleveland 14, O.

IRON OXIDES

Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.
Delta Oil Products Co., Milwaukee 9, Wis.
Tamms Industries Inc., 228 N. LaSalle St., Chicago 1, Ill.

JACKETS (Mold)

Adams Co., Dubuque, Iowa.
Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.
Fremont Flask Co., Fremont, O.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.
Industrial Fabricating, Inc., 817 Hall St., Eaton Rapids, Mich.

LABORATORY EQUIPMENT (Chemical)

Harry W. Dietert Co., 9330A Roselawn Ave., Detroit 4, Mich.

LABORATORY EQUIPMENT (Physical)

Harry W. Dietert Co., 9330A Roselawn Ave., Detroit 4, Mich.
Claude S. Gordon Co., 3000 So. Wallace, Chicago 16, Ill.
National Engineering Co., 549 W. Washington St., Chicago 6. Ill.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Norton Co., Worcester 6, Mass.

LADLES

Industrial Equipment Co., Minster, O.
Industrial Fabricating, Inc., 817 Hall St., Eaton Rapids, Mich.
Modern Equipment Co., Port Washington, Wis.
Frederic B. Stevens, Inc., Detroit 16, Mich.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

LADLE LININGS

General Refractories Co., 1520 Locust St., Philadelphia 2, Pa.
Harbison-Walker Refractories Co. 1745 Farmers Bank Bldg., Pittsburgh 22, Pa.
Ironton Fire Brick Co., Ironton, Ohio.
United States Graphite Co., Saginaw, Mich.

LEAD

Federated Metals Div., American Smelting and Refining Co., 120 Broadway, New York 5.

LIFT TRUCKS

Frank G. Hough Co., Libertyville, Ill.
Towmotor Corp., 1226 East 152nd St., Cleveland 10, Ohio

LINSEED OIL

Hercules Powder Co., Wilmington 99, Del.

LOADERS

Clearfield Machine Co., Clearfield, Pa.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.

LOADERS (Tractor-Mounted)

Frank G. Hough Co., Libertyville, Ill.

LUBRICANTS (Industrial)

Acheson Colloids Corp., Port Huron, Mich.
Smith Oil & Refining Co., 1102 Kilburn Ave., Rockford, Ill.
United States Graphite Co., Saginaw, Mich.

MACHINE KEYS

Standard Horse Nail Corp., New Brighton, Pa.

MACHINISTS VISES

Columbian Vise & Mfg. Co., 9021 Bessemer Ave., Cleveland, Ohio

MAGNESIUM (Ingots)

Apex Smelting Co., 2537 West Taylor St., Chicago 12, Ill.
Federated Metals Division of American Smelting and Refining Co., 120 Broadway, New York 5, N.Y.

MAGNET CONTROLLERS

Ohio Electric Mfg. Co., 5906 Maurice Ave., Cleveland, Ohio.

MAGNETS

Dings Magnetic Separator Co., 4740 Electric Ave., Milwaukee 7, Wis.
Ohio Electric Mfg. Co., 5906 Maurice Ave., Cleveland, Ohio.
Stearns Magnetic Mfg. Co., 662 S. 28th St., Milwaukee 4, Wis.

MARKING CRAYONS

Markal Co., 3052 W. Carroll, Chicago 12, Ill.

MATCH PLATE METAL

Federated Metals Division of American Smelting and Refining Co., 120 Broadway, New York 5, N.Y.

MATCHPLATES

Accurate Match Plate Co., 1847 W. Carroll St., Chicago, Ill.
Central Pattern Co., Quincy, Ill.
Champion Foundry & Machine Co., 1553 W. Madison St., Chicago 7, Ill.
City Pattern Foundry & Machine Co,. 1161 Harper, Detroit 11, Mich.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.
Plaster Process Castings Co., 6922 Carnegie Ave., Cleveland 3, O.
Pressure Cast Products Co., 1028 Vermont Ave., Detroit 16, Mich.
Scientific Cast Products Corp., 1388-92 E. 40th St., Cleveland 3. O.
Arthur E. Will, 643 West 11th St., Erie, Pa.

MATERIALS HANDLING EQUIPT.

Frank G. Hough Co., Libertyville, Ill.
Youngstown Steel Door Co., Euclid Superior Arcade, Cleveland, Ohio

MECHANICAL ENGINEERS

Giffels & Vallet, Inc., Marquette Bldg., Detroit, Mich.

MELTING POTS

Acme Foundry Co., Detroit 16, Mich.

METAL CLEANING EQUIPMENT

American Wheelabrator & Equipment Co., Mishawaka, Ind.
Pangborn Corp., Hagerstown, Md.

METALLOGRAPHIC EQUIPMENT

Harry W. Dietert Co., 9330A Roselawn Ave., Detroit 4, Mich.
General Electric Co., X-Ray Dept., 4855 Electric Ave., Milwaukee 14, Wis.

METALLURGICAL CHEMISTS

Chas. C. Kawin Co., 37 Franklin St., P.O. Box 2035, Chicago, Ill.

METALLURGISTS

Crobaugh Co., Frank L., 1426 West Third St., Cleveland 13, Ohio.

METERS (Gas, Air, Water)

Illinois Testing Laboratories, Inc., 418 N. LaSalle St., Chicago 10, Ill.
Roots-Connersville Blower Corp., Connersville, Ind.

MIXERS (Core Wash)

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Multiplex Machinery Corp., Elmore, Ohio.

MIXERS (Sand and Clay)

American Wheelabrator & Equipment Co., 505 S. Byrkit St., Mishawaka, Ind.
Beardsley & Piper Co., The, 2424 No. Cicero, Chicago 39, Ill.
Blystone Division, Standard Sand & Machine Co., 549 W. Washington Blvd., Chicago 6, Ill.
Clearfield Machine Co., Clearfield, Pa.
Construction Machinery Co., Waterloo, Iowa.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, Ohio.
Jeffrey Mfg. Co., 907 N. Fourth St., Columbus 16, O.
Multiplex Machinery Corp., Elmore, Ohio.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Posey Iron Works, Inc., Lancaster, Pa.
Royer Foundry & Machine Co., Kingston, Pa.

MOLD CONVEYORS

Bartlett & Snow, C. O., Co., 6201 Harvard Ave., Cleveland 5, O.
Beardsley & Piper Co., The, 2424 No. Cicero, Chicago 39, Ill.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, Ohio.
Jeffrey Mfg. Co., 907-99 N. Fourth St., Columbus 16, O.
Link-Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
Logan Co., 580 Cabel. Louisville, Ky.
Mathews Conveyer Co., Ellwood City, Pa.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Newago Engineering Co., Newago, Mich.

MOLD OVENS and DRYERS

Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Despatch Oven Co., Minneapolis 14, Minn.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, O.
Lanly Company, 750 Prospect Ave., Cleveland 15, O.

MOLD WASH

Acheson Colloids Corp., Port Huron, Mich.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
National Carbon Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.
Frederic B. Stevens, Inc., 18th St. & Vernor Highway, Detroit 16, Mich.
United States Graphite Co., Saginaw, Mich.

MOLDERS' TOOLS

Monk Tool Co., Geneva, Illinois

MOLDING MACHINES

Adams Co., Dubuque, Iowa.
Beardsley & Piper Co., The, 2424 N. Cicero, Chicago 39, Ill.
Berkshire Mfg. Co., 1111 Power Ave., Cleveland 14, Ohio.
Champion Foundry & Machine Co., 1553 W. Madison St., Chicago 7, Ill.
Davenport Machine & Foundry Co., Davenport, Iowa.
Haynes Foundry Equipment Co., 814 Ada St., Kalamazoo, Mich.
Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa.
International Molding Machine Co., LaGrange Park, Ill.
Johnston & Jennings Div., Pettibone-Mulliken Corp., 2424 No. Cicero Ave., Chicago 39, Ill.
Milwaukee Foundry Equipment Div. Spo Inc., 3328 W. Pierce St., Milwaukee 4, Wis.
Nicholls, Wm. H., Co., Richmond Hill, Long Island 18, N. Y.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, O.
S. P. O. Incorporated, 7500 Grand Division Ave., Cleveland 5, O.
Sutter Products Co., Dearborn, Mich.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.

MOLDING MACHINES (Jolt)

Adams Co., Dubuque, Iowa.
Champion Foundry & Machine Co., 1553 West Madison St., Chicago 7, Ill.
Davenport Machine & Foundry Co., Davenport, Iowa.
Haynes Foundry Equipment Co., 814 Ada St., Kalamazoo, Mich.
Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa.
International Molding Machine Co., LaGrange Park, Ill.
Johnston & Jennings Div., Pettibone-Mulliken Corp., 2424 No. Cicero Ave., Chicago 39, Ill.
Milwaukee Foundry Equipment Div., Spo Inc., 3328 Pierce St., Milwaukee 4, Wis.
Nicholls, Wm. H., Co., Richmond Hill, Long Island 18, N. Y.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, O.
S. P. O. Incorporated, 7500 Grand Division Ave., Cleveland 5, O.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.

MOLDING MACHINES (Rollover)

Champion Foundry & Machine Co., 1553 W. Madison St., Chicago 7, Ill.
Davenport Machine & Foundry Co., Davenport, Iowa.
Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa.
International Molding Machine Co., LaGrange Park, Ill.
Johnston & Jennings Div., Pettibone-Mulliken Corp., 2424 No. Cicero Ave., Chicago 39, Ill.

MOLDING MACHINES (Rollover) (Cont'd)

Milwaukee Foundry Equipment Div., Spo Inc., 3328 Pierce St., Milwaukee 4, Wis.
Nicholls, Wm. H., Co., Richmond Hill, Long Island 18, N. Y.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, O.
S. P. O. Incorporated, 7500 Grand Division Ave., Cleveland 5, O.
Sutter Products Co., Dearborn, Mich.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.

MOLDING MACHINES (Squeeze)

Adams Co., Dubuque, Iowa.
Champion Foundry & Machine Co., 1553 W. Madison St., Chicago 7, Ill.
Davenport Machine & Foundry Co., Davenport, Iowa.
Haynes Foundry Equipment Co., 814 Ada St., Kalamazoo, Mich.
Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa.
International Molding Machine Co., LaGrange Park, Ill.
Johnston & Jennings Div., Pettibone-Mulliken Corp. 2424 No. Cicero Ave., Chicago 39, Ill.
Milwaukee Foundry Equipment Div., Spo Inc., 3328 Pierce St., Milwaukee 4, Wis.
Nicholls, Wm. H., Co., Richmond Hill, Long Island 18, N. Y.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, Ohio.
S. P. O. Incorporated, 7500 Grand Division Ave., Cleveland 5, O.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.

MOLDING SANDS

American Silica Sand Co., Central Life Bldg., Ottawa, Ill.
Foundries Materials Co., Coldwater, Mich.
Great Lakes Foundry Sand Co., United Artists Bldg., Detroit 26, Mich.
Orefraction Inc., 7425 Thomas St., Pittsburgh 8, Pa.
Ottawa Silica Co., Ottawa, Ill.
Standard Silica Corp., 209 So. LaSalle St., Chicago 4, Ill.
Wedron Silica Co., 38 So. Dearborn St., Chicago, Ill.

MOLYBDENUM

Molybdenum Corporation of America, Pittsburgh 19, Pa.

MONOGRAMS & TRADE MARKS

H. P. Maughlin Co., 953 Ingleside Ave., Columbus, Ohio.

MONORAIL SYSTEMS

American Monorail Co., 13104 Athens Ave., Cleveland 7, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1155 East 283rd St., Wickliffe, O.
Link-Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
Modern Equipment Co., Port Washington, Wis.

MOTORS (Electric)

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
Ohio Electric Mfg. Co., 5906 Maurice Ave., Cleveland, Ohio.

NAILS (Chill)

Crescent Brass & Pin Co., 5766 Trumbull Ave., Detroit, Mich.
Republic Steel Corp., 3100 E. 45th St., Cleveland 4, Ohio.
Standard Horse Nail Corp., New Brighton, Pa.

NICKEL

International Nickel Co., Inc., 67 Wall St., New York City 5.

NITROGEN

Air Reduction Sales Co., 60 East 42nd St., New York 17, N. Y.
Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y.

NOZZLES (Blasting)

Alloy Metal Abrasives Co., 311 W. Huron St., Ann Arbor, Mich.
American Wheelabrator & Equipment Co., 505 S. Byrkit St., Mishawaka, Ind.
Davenport Machine & Foundry Co., Davenport, Iowa.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Norton Co., Worcester 6, Mass.
Pangborn Corp., Hagerstown, Md.
W. W. Sly Mfg. Co., 4753 Train Ave., Cleveland 2, Ohio.

OIL BURNERS

Hauck Manufacturing Co., 106 Tenth St., Brooklyn 15, N. Y.
Lindberg Engineering Co., Fisher Furnace Div., 2450 West Hubbard, Chicago 12, Ill.
Stroman Furnace & Engineering Co., Div. of Peterson Oven Co., 9900 Franklin Ave., Franklin Park, Ill.

OPEN HEARTH DOORS

Wm. M. Bailey Co., Pittsburgh 16, Pa.

OVENS (Annealing and Heat Treating)

Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Despatch Oven Co., Minneapolis 14, Minn.
Electric Furnace Co., West Wilson St., Salem, Ohio.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.
Lanly Company, 750 Prospect Ave., Cleveland 15, O.
Lindberg Engineering Co., Fisher Furnace Div., 2450 West Hubbard, Chicago 12, Ill.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

OVENS (Core) (See CORE OVENS)

OVENS (Enameling, Japanning)

Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Despatch Oven Co., Minneapolis 14, Minn.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.
Kirk & Blum Mfg. Co., Cincinnati 9, Ohio
Lanly Co., 750 Prospect Ave., Cleveland 15, Ohio.

OVENS (Mold Drying)

Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Despatch Oven Co., Minneapolis 14, Minn.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.
Kirk & Blum Mfg. Co., Cincinnati 9, Ohio
Lanly Co., 750 Prospect Ave., Cleveland 15, Ohio.
Michigan Oven Co., 4500 Grand River Ave., Detroit 8, Mich.

OXYGEN

Air Reduction Sales Co., 60 East 42nd St., New York 17, N. Y.
Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y.

PAINTS (Graphite)

Joseph Dixon Crucible Co., Monmouth St., Jersey City, N. J.

PARTING COMPOUND (Silicone)

Dow Corning Corp., Midland, Mich.

PARTING COMPOUNDS

Acheson Colloids Corp., Port Huron, Mich.
Delta Oil Products Co., Milwaukee 9, Wis.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
E. F. Houghton Co., 303 W. Lehigh Ave., Philadelphia 33, Pa.

PARTING COMPOUNDS (Cont'd.)

Smith Oil & Refining Co., 1102 Kilburn Ave., Rockford, Ill.
Frederic B. Stevens, Inc., Detroit 16, Mich.
Tamms Industries Inc., 228 N. LaSalle St., Chicago 1, Ill.

PATTERN COATINGS

Acheson Colloids Corp., Port Huron, Mich.
American Lacquer Solvents Co., Phoenixville, Pa.

PATTERN COMPOUND

Pressure Cast Products Co., 1028 Vermont Ave., Detroit 16, Mich.
Tamms Industries Inc., 228 N. LaSalle St., Chicago 1, Ill.

PATTERN LETTERS

Freeman Supply Co., 1152 East Broadway, Toledo, Ohio.
H. P. Maughlin Co., 953 Ingleside Ave., Columbus, Ohio.

PATTERN LUMBER

Dougherty Lumber Co., Cleveland 5, O.
Freeman Supply Co., 1152 East Broadway, Toledo, Ohio.
Rietz Lumber Co., 1810 N. Central Park Ave., Chicago, Ill.

PATTERNMAKER'S VISES

Columbian Vise & Mfg. Co., 9021 Bessemer Ave., Cleveland, Ohio.

PATTERN METAL

Federated Metals Division of American Smelting and Refining Co., 120 Broadway, New York 5, N. Y.
Niagara Falls Smelting & Refining Div., Continental-United Industries Co. Inc., 2204 Elmwood Ave., Buffalo 17, New York

PATTERN PLATES

Accurate Match Plate Co., 1847 W. Carroll St., Chicago, Ill.
Buffalo Pattern Works, 830 Hertel Ave., Buffalo, N. Y.
City Pattern Foundry & Machine Co., 1161 Harper, Detroit 11, Mich.
Freeman Supply Co., 1152 East Broadway, Toledo, Ohio.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.
Plaster Process Castings Co., 6922 Carnegie Ave., Cleveland 3.
Scientific Cast Products Corp., 1388-92 E. 40th St., Cleveland 3, O.
Arthur E. Will, 643 West 11th St., Erie, Pa.

PATTERN SHOP EQUIPMENT

Do All Company, Des Plaines, Ill.
Freeman Supply Co., 1152 East Broadway, Toledo, Ohio.
Milwaukee Leather Belting Co., 1114 No. Water St., Milwaukee, Wis.
Oliver Machinery Company, Grand Rapids 2, Mich.

PATTERNS (Plastic)

Central Pattern Co., Quincy, Ill.

PATTERNS (Wood, Metal)

Accurate Match Plate Co., 1847 W. Carroll St., Chicago, Ill.
Buffalo Pattern Works, 830 Hertel Ave., Buffalo, N. Y.

PATTERNS (Wood, Metal) (Cont'd.)

Central Pattern Co., Quincy, Ill.
City Pattern Foundry & Machine Co., 1161 Harper, Detroit 11, Mich.
Champion Foundry & Machine Co., 1553 W. Madison St., Chicago 7, Ill.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.
Pressure Cast Products Co., 1028 Vermont Ave., Detroit 16, Mich.
S.P.O. Incorporated, 7500 Grand Division Ave., Cleveland 5, O.
Wellman Bronze & Aluminum Co., 2525 E. 93rd St., Cleveland 4, O.
Arthur E. Will, 643 West 11th St., Erie, Pa.

PERMANENT MOLDS

Centrifugal Casting Machine Co., Tulsa, Okla.
National Carbon Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.
Rossborough Supply Co., 3376 West 137th St., Cleveland, Ohio

PHOSPHOR COPPER

Federated Metals Division of American Smelting and Refining Co., 120 Broadway, New York 5, N.Y.
Niagara Falls Smelting & Refining Div. Continental-United Industries Co. Inc., 2204 Elmwood Ave., Buffalo 17, N. Y.

PHOTOGRAPHIC EQUIPMENT

Eastman Kodak Co., Rochester, N. Y.
General Electric Co., X-Ray Dept., 4855 Electric Ave., Milwaukee 14, Wis.

PHOTOGRAPHY (Industrial)

Eastman Kodak Co., Rochester, N. Y.

PIG CASTING MACHINES

Wm. M. Bailey Co., Pittsburgh 16, Pa.

PIG IRON

Hickman-Williams & Co., Union Commerce Bldg., Cleveland 14, O.
Jackson Iron & Steel Co., Jackson, Ohio.
Keokuk Electro Metals Co., 429 So. 4th St., Keokuk, Iowa.
Miller & Company, 332 S. Michigan Ave., Chicago 4, Ill.
Pickands, Mather & Co., Cleveland 14, O.
Republic Steel Corp., 3100 E. 45th St., Cleveland 4, Ohio.
Woodward Iron Co., Woodward, Ala.

PIG IRON (Silvery)

Jackson Iron & Steel Co., Jackson, O.
Keokuk Electro Metals Co., 429 So. 4th St., Keokuk, Iowa.
Miller & Company, 332 S. Michigan Ave., Chicago 4, Ill.

PINS (Flask)

Black, Sivalls & Bryson, Inc., 7500 E. 12th St., Kansas City 3, Mo.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.
Shanafelt Mfg. Co., 3623 Winfield Way, N.E., Canton 5, Ohio.
Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.
Truscon Steel Co., Pressed Steel Div., 6100 Truscon Ave., Cleveland, Ohio.
Universal Engineering Co., Frankenmuth, Mich.
V-G Flask & Fitting Co., Box 467, Madison, Conn.

PISTON RINGS

National Carbon Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.

PISTON RINGS (for Molding Machines, Compressors, etc.)

Nicholls, Wm. H., Co., Richmond Hill, Long Island 18, N. Y.

PLANT ENGINEERING SERVICE

H. K. Ferguson Co., 1783 E. 11th St., Cleveland 14, Ohio.
Giffels & Vallet, Inc., Marquette Bldg., Detroit, Mich.
Lester B. Knight & Associates, Inc., 600 West Jackson Blvd., Chicago 3, Ill.

PLATES (Bottom)

Adams Co., Dubuque, Iowa.
Black, Sivalls & Bryson, Inc., 7500 E. 12th St., Kansas City 3, Mo.
Christiansen Corp., 1515 No. Kilpatrick, Chicago 51, Ill.
Shanafelt Mfg. Co., Canton, Ohio
Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.

PLATES (Core Drying)

Black, Sivalls & Bryson, Inc., 7500 E. 12th St., Kansas City 3, Mo.
Champion Foundry & Machine Co., 1553 W. Madison St., Chicago 7, Ill.
Christiansen Corp., 1515 No. Kilpatrick, Chicago 51, Ill.
Johns-Manville, 22 East 40th St., New York 16.

PLUMBAGO

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Frederic B. Stevens, Inc., Detroit 16, Mich.
United States Graphite Co., Saginaw, Mich.

PNEUMATIC TOOLS

Arrow Tools Inc., 1900 S. Kostner, Chicago, Ill.
Chicago Pneumatic Tool Co., 6 East 44th St., New York 17, N. Y.
Cleco Pneumatic Tool Div., Reed Roller Bit Co., Houston, Texas.
Dayton Pneumatic Tool Co., Dayton 1, Ohio.
Gardner-Denver Co., Quincy, Ill.
Independent Pneumatic Tool Co., Aurora, Ill.
Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.
Joy Mfg. Co., Sullivan Division, Michigan City, Ind.
Master Pneumatic Tool Co., Inc., Orwell, Ohio.
Rotor Tool Co., 17325 Euclid Ave., Cleveland 12, Ohio.
Schramm Inc., West Chester, Pa.

POLISHING MACHINES

Bradford Machine Tool Co., 659 Evans St., Cincinnati, Ohio.

POURING DEVICES

Industrial Equipment Co., Minster, Ohio.
Modern Equipment Co., Port Washington, Wis.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

PRESSER BOARDS

Adams Co., Dubuque, Iowa.
Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.
Christiansen Corp., 1515 No. Kilpatrick, Chicago 51, Ill.
V-G Flask & Fitting Co., Box 467, Madison, Conn.

PRESSURE RECORDERS

Foxboro Company, Foxboro, Mass.

PROTECTIVE MATERIALS (X-Ray)

General Electric Co., X-Ray Dept., 4855 Electric Ave., Milwaukee 14, Wis.

PULLEYS (Magnetic)

Dings Magnetic Separator Co., 4740 Electric Ave., Milwaukee 7, Wis.
Homer Mfg. Co., Lima, Ohio.
Stearns Magnetic Mfg. Co., 662 S. 28th St., Milwaukee 4, Wis.

PUMPS

Construction Machinery Co., Waterloo, Iowa.
Gardner-Denver Co., Quincy, Ill.
Worthington Pump & Machinery Co., Harrison, N. J.

PUMPS (Dry, Vacuum)

Allis Chalmers Mfg. Co., Milwaukee 1, Wis.
Fuller Company, Catasauqua, Pa.
Roots-Connersville Blower Corp., Connersville, Ind.

PURIFIERS

Cleveland Flux Co., 1026 Main St., Cleveland 13, O.

PUSH-OFF MACHINES

Beardsley & Piper Co., 2424 N. Cicero, Chicago 39, Ill.
Champion Foundry & Machine Co., 1553 W. Madison St., Chicago 7, Ill.
International Molding Machine Co., LaGrange Park, Ill.
Milwaukee Foundry Equipment Div. Spo Inc., 3238 W. Pierce St., Milwaukee 4, Wis.

PUTTY (Foundry)

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.

PYROMETERS

Elematic Equipment Corp., 1150 W. Marquette, Chicago 2, Ill.
Foxboro Company, Foxboro, Mass.
Harry W. Dietert Co., 9330A Roselawn Ave., Detroit 4, Mich.
Claude S. Gordon Co., 3000 So. Wallace, Chicago 16, Ill.
Illinois Testing Laboratories, Inc., 418 N. LaSalle St., Chicago 10, Ill.
Marshall Co., L. H., 270 W. Lane Columbus 1, O.
Pyrometer Instrument Co., Bergenfield, N. J.
Tamms Industries Inc., 228 N. LaSalle St., Chicago 1, Ill.

PYROMETERS (Immersion)

Pyrometer Instrument Co., Bergenfield, N. J.

PYROMETERS (Optical)

Pyrometer Instrument Co., Bergenfield, N. J.

RACKS (Core Ovens)

Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.
Kirk & Blum Mfg. Co., Cincinnati 9, Ohio.

RADIOGRAPHY (Industrial)

Eastman Kodak Co., Rochester, N. Y.
Radium Chemical Co., Inc., 570 Lexington Ave., New York 22, N. Y.

RADIUM

Radium Chemical Co., Inc., 570 Lexington Ave., New York 22, N. Y.

REFRACTORIES

Babcock & Wilcox Co., 85 Liberty St., New York 6, N. Y.
Carborundum Co., Niagara Falls, N. Y.
Carborundum Co., Perth Amboy, N. J.
Cleveland Quarries Co., 1740 E. 12th St., Cleveland 14, O.

REFRACTORIES (Cont'd.)

Joseph Dixon Crucible Co., Monmouth St., Jersey City, N. J.
Eastern Clay Products, Inc., Jackson, O.
Electro Refractories & Abrasive Corp., Vars Bldg., Buffalo 2, N.Y.
General Refractories Co., 1520 Locust St., Philadelphia 2, Pa.
Harbison-Walker Refractories Co., 1745 Farmers Bank Bldg., Pittsburgh 22, Pa.
Ironton Fire Brick Co., Ironton, O.
Lindberg Engineering Co., Fisher Furnace Div., 2450 West Hubbard, Chicago 12, Ill.
National Carbon Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.
National Crucible Co., Mermaid Lane and Queen Sts., Philadelphia 18, Pa.
Norton Co., Worcester 6, Mass.
Richard C. Remmey Son Co., Hedley St. & Delaware River, Philadelphia 37, Pa.
Frederic B. Stevens, Inc., 18th St. & Vernor Highway, Detroit 16, Mich.
Titanium Alloy Mfg. Div., National Lead Co., Hyde Park Blvd., Niagara Falls, N. Y.
United States Graphite Co., Saginaw, Mich.

REGULATORS (Gas or Oil)

The North American Mfg. Co., 4455 E. 71st St., Cleveland 4, Ohio.

RESPIRATORS

Wilson Products Inc., Reading, Pa.

RIDDLES (Electric)

Champion Foundry & Machine Co., 1553 W. Madison St., Chicago 7, Ill.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Foundry Supplies & Mfg. Co., 2221 Orchard St., Chicago 14, Ill.
Great Western Mfg. Co., Leavenworth, Kans.

RIDDLES (Hand)

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Frederic B. Stevens, Inc., 18th St. & Vernor Highway, Detroit 16, Mich.

RISERS (Blind)

Dodge Steel Co., State Road & Hellerman St., Philadelphia, Pa.

ROD DIP

Smith Oil & Refining Co., 1102 Kilburn Ave., Rockford, Ill.

ROD STRAIGHTENERS

American Wheelabrator & Equipment Co., Mishawaka, Ind.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.

ROLLER-HEARTH FURNACES (Electric Annealing)

General Electric Co., Schenectady, N. Y.
Holcroft & Company, 6545 Epworth Blvd., Detroit 10, Mich.

RUBBER LINING MATERIAL (Abrasive Resisting)

Pangborn Corp., Hagerstown, Md.

SAFETY CLOTHING

American Optical Co., Southbridge, Mass.
B. F. McDonald Co., 5721 West 96th St., Los Angeles 37, Calif.
Pangborn Corp., Hagerstown, Md.

SAND ARRESTER TUBES

Martin Engineering Co., Kewanee, Ill.

SAND (Core, Molding, Blasting)

American Silica Sand Co., Central Life Bldg., Ottawa, Ill.
Carpenter Brothers, Inc., 606 West Wisconsin, Milwaukee 3, Wis.
Concrete Materials Co., La Fayette Building, Waterloo, Iowa
Great Lakes Foundry Sand Co., United Artists Bldg., Detroit 26, Mich.
Nugent Sand Co., Muskegon, Mich.

SAND (Core, Molding, Blasting) (Cont'd.)

Orefraction Inc., 7425 Thomas St., Pittsburgh 8, Pa.
Ottawa Silica Co., Ottawa, Ill.
Pangborn Corp., Hagerstown, Md.
Producers Core Sand Corp., Michigan City, Ind.
Standard Silica Corp., 209 So. LaSalle St., Chicago 4, Ill.
Titanium Alloy Mfg. Div., National Lead Co., Hyde Park Blvd., Niagara Falls, N. Y.
Wedron Silica Co., 38 So. Dearborn St., Chicago, Ill.

SAND BLAST BARRELS

American Wheelabrator & Equipment Co., 505 S. Byrkit St., Mishawaka, Ind.
Pangborn Corp., Hagerstown, Md.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.
W. W. Sly Mfg. Co., 4753 Train Ave,. Cleveland 2, Ohio.

SAND BLAST CABINETS

American Wheelabrator & Equipment Co., 505 S. Byrkit St., Mishawaka, Ind.
Pangborn Corp., Hagerstown, Md.

SAND BLAST EQUIPMENT

American Air Filter Co., 266 Central Ave., Louisville 8, Ky.
American Wheelabrator & Equipment Co., 505 S. Byrkit St., Mishawaka, Ind.
Pangborn Corp., Hagerstown, Md.
W. W. Sly Mfg. Co., 4753 Train Ave., Cleveland 2, Ohio.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.

SAND BLAST NOZZLES

American Wheelabrator & Equipment Co., Mishawaka, Ind.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Norton Company, Worcester 6, Mass.
Pangborn Corp., Hagerstown, Md.
W. W. Sly Mfg. Co., 4753 Train Ave., Cleveland 2, Ohio.

SAND BLAST ROOMS

American Wheelabrator & Equipment Co., Washawaka, Ind.
Pangborn Corp., Hagerstown, Md.
W. W. Sly Mfg. Co., 4753 Train Ave., Cleveland 2, Ohio.

SAND BLAST TABLES

American Wheelabrator & Equipment Co., Mishawaka, Ind.
Pangborn Corp., Hagerstown, Md.
W. W. Sly Mfg. Co., 4753 Train Ave., Cleveland 2, Ohio.

SAND CONTROL & TESTING EQUIPMENT

Beardsley & Piper Co., 2424 No. Cicero, Chicago 39, Ill.
Harry W. Dietert Co., 9330A Roselawn Ave., Detrot 4, Mich.
Claude S. Gordon Co., 3000 So. Wallace, Chicago 16, Ill.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.

SAND CONVEYING and HANDLING EQUIPMENT

Ajax Flexible Coupling Co., Westfield, N. Y.
American Air Filter Co., Louisville 8, Ky.
C. O. Bartlett & Snow Co., 6201 Harvard Ave., Cleveland 5, O.
Beardsley & Piper Co., The, 2424 No. Cicero, Chicago 39, Ill.
Clearfield Machine Co., Clearfield, Pa.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, Ohio.
Frank G. Hough Co., Libertyville, Ill.
Jeffrey Mfg. Co., 907-99 N. Fourth St., Columbus 16, O.
Joy Mfg. Co., Joy Division, Pittsburgh, Pa.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Newaygo Engineering Co., Newaygo, Mich.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, 14, O.

SAND CONVEYING and HANDLING EQUIPMENT (Cont'd.)

Pekay Machine & Engineering Co., 100 N. LaSalle St., Chicago 2, Ill.
Penn Iron Works, Reading, Pa.
Royer Foundry & Machine Co., Kingston, Pa.
Youngstown Steel Door Co., Euclid Superior Arcade, Cleveland, Ohio

SAND CONVEYING and HANDLING EQUIPMENT (Pneumatic)

Fuller Company, Catasauqua, Pa.
Robins Conveyors Div., Hewitt-Robins Inc., 270 Passaic Ave., Passaic, N. J.

SAND DRYERS

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
Bartlett & Snow Co., C. O., 6201 Harvard Ave., Cleveland 5, Ohio.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
Nichols Engineering & Research Corp., 70 Pine St., New York 5, N. Y.

SANDERS (Pneumatic)

Cleco Division of Reed Roller Bit Co., Houston, Texas.

SANDING MACHINERY (Disc, Spindle, Belt, etc.)

Freeman Supply Co., 1152 E. Broadway, Toledo 5, Ohio.
Oliver Machinery Company, Grand Rapids 2, Mich.

SAND MEASURING and WEIGHING DEVICES

Baker Perkins Inc., Saginaw, Mich.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.

SAND MIXERS

American Wheelabrator & Equipment Co., Mishawaka, Ind.
Baker Perkins Inc., Saginaw, Mich.
Beardsley & Piper Co., The, 2424 N. Cicero, Chicago 39, Ill.
Standard Sand & Machine Co., Blystone Division, 549 W. Washington Blvd., Chicago 6, Ill.
Clearfield Machine Co., Clearfield, Pa.
Construction Machinery Corp., Waterloo, Iowa.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, Ohio.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
Multiplex Machinery Corp., Elmore, Ohio.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Pekay Machine & Engineering Co., 100 N. LaSalle St., Chicago 2, Ill.
Royer Foundry & Machine Co., Kingston, Pa.

SAND PREPARATION EQUIPMENT

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
American Wheelabrator & Equipment Co., Mishawaka, Ind.
Baker Perkins Inc., Saginaw, Mich
Bartlett & Snow Co., C. O., 6201 Harvard Ave., Cleveland 5, O.
Beardsley & Piper Co., The, 2424 N. Cicero, Chicago 39, Ill.
Clearfield Machine Co., Clearfield, Pa.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, Ohio.
Jeffrey Mfg. Co., 907-99 N. Fourth St., Columbus 16, O.
Moulders Friend, Dallas City, Ill.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Newaygo Engineering Co., Newaygo, Mich.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, O.
Pekay Machine & Engineering Co., 100 N. LaSalle St., Chicago 2, Ill.
Royer Foundry & Machine Co., Kingston, Pa.
Simplicity Engineering Co., Durand, Mich.

SAND RAMMERS

Chicago Pneumatic Tool Co., 6 East 44th St., New York 17, N. Y.
Cleco Pneumatic Tool Div., Reed Roller Bit Co., Houston, Texas.
Dayton Pneumatic Tool Co., Dayton 1, O.
Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa.
Master Pneumatic Tool Co., Inc., Orwell, Ohio.
Rotor Tool Co., 17325 Euclid Ave., Cleveland 12, Ohio.

SAND RECLAIMERS

Jeffrey Mfg. Co., 907 N. Fourth St., Columbus 16, O.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Newaygo Engineering Co., Newaygo, Mich.
Nichols Engineering & Research Corp., 70 Pine St., New York 5, N. Y.
Stearns Magnetic Mfg. Co., 662 S. 28th St., Milwaukee 4, Wis.

SAND SIFTING and SCREENING MACHINERY

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
American Air Filter Co., Louisville 8, Ky.
Bartlett & Snow, C. O., Co., 6201 Harvard Ave., Cleveland 5, Ohio.
Beardsley & Piper Co., The, 2424 N. Cicero, Chicago 39, Ill.
Champion Foundry & Machine Co., 1553 W. Madison St., Chicago 7, Ill.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Foundry Supplies & Mfg. Co., 2221 Orchard St., Chicago 14, Ill.
Great Western Mfg. Co., Leavenworth, Kansas.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Royer Foundry & Machine Co., Kingston, Pa.
Simplicity Engineering Co., Durand, Mich.
Pangborn Corp., Hagerstown, Md.

SAND STORAGE BINS & GATES

Bartlett & Snow, C. O., Co., 6201 Harvard Ave., Cleveland 5, Ohio.
Beardsley & Piper Co., The, 2424 No. Cicero, Chicago 39, Ill.
Jeffrey Mfg. Co., Columbus 16, O.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Newaygo Engineering Co., Newaygo, Mich.

SAWS (Band, Metal, Wood)

Atlantic Saw Mfg. Co., New Haven, Conn.
Do All Company, Des Plaines, Ill.
Oliver Machinery Company, Grand Rapids 2, Mich.

SAWS (Cold Metal)

Do All Company, Des Plaines, Ill.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.

SCALES

Toledo Scale Co., Toledo, Ohio.

SCALING HAMMERS

Joy Mfg. Co., Sullivan Division, Michigan City, Ind.
Rotor Tool Co., 17325 Euclid Ave., Cleveland 12, Ohio.
Schramm, Inc., West Chester, Pa.

SCREENS (Shake-Out)

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
Bartlett & Snow, C. O., Co., 6201 Harvard Ave., Cleveland 5, Ohio.

SCREENS (Shake-Out) (Cont'd.)

Beardsley & Piper Co., 2424 N. Cicero, Chicago 39, Ill.

Jeffrey Mfg. Co., 907 N. Fourth St., Columbus 16, O.

Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.

National Engineering Co., 549 W. Washington St., Chicago 6, Ill.

Simplicity Engineering Co., Durand, Mich.

SCREENS (Vibrating)

Ajax Flexible Coupling Co., Westfield, N. Y.

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.

Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.

Robins Conveyors Div., Hewitt-Robins Inc., 270 Passaic Ave., Passaic, N. J.

Simplicity Engineering Co., Durand, Mich.

SEA COAL

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.

Frederic B. Stevens, Inc., Detroit 16, Mich.

SEPARATORS (Abrasive)

American Wheelabrator & Equipment Co., Mishawaka, Ind.

Pangborn Corp., Hagerstown, Md.

SEPARATORS (Air, Moisture, Oil)

American Air Filter Co., Louisville 8, Ky.

American Wheelabrator & Equipment Co., Mishawaka, Ind.

Jas. A. Murphy & Co., Hamilton, O.

Pangborn Corp., Hagerstown, Md.

A. Schrader's Son, 470 Vanderbilt Ave., Brooklyn 17, N. Y.

SEPARATORS (Magnetic)

Beardsley & Piper Co., 2424 No. Cicero, Chicago 39, Ill.

Dings Magnetic Separator Co., 4740 Electric Ave., Milwaukee 7, Wis.

Homer Mfg. Co., Lima, Ohio.

National Engineering Co., 549 W. Washington St., Chicago 6, Ill.

Stearns Magnetic Mfg. Co., 662 S. 28th St., Milwaukee 4, Wis.

SHAKE-OUT MACHINERY

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.

American Air Filter Co., Louisville 8, Ky.

Bartlett & Snow, C. O., Co., 6201 Harvard Ave., Cleveland 5, O.

Beardsley & Piper Co., 2424 No. Cicero, Chicago 39, Ill.

Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa.

Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.

New Haven Vibrator Co., 131 Chestnut St., New Haven 7, Conn.

Robins Conveyors, Div., Hewitt-Robins Inc., 270 Passaic Ave., Passaic, N. J.

Royer Foundry & Machine Co., Kingston, Pa.

Simplicity Engineering Co., Durand, Mich.

SHOT AND GRIT

Alloy Metal Abrasive Co., 311 W. Huron St., Ann Arbor, Mich.

American Wheelabrator & Equipment Co., Mishawaka, Ind.

American Steel Abrasives Co., Galion, O.

SHOT & GRIT (Cont'd.)

Carpenter Brothers, Inc., 606 West Wisconsin, Milwaukee 3, Wis.

Clayton Sherman Abrasives Co., 3896 Lonyo Rd., Detroit 10, Mich.

Cleveland Metal Abrasive Co., 887 E. 67th St., Cleveland, Ohio.

Hickman-Williams & Co., Union Commerce Bldg., Cleveland 14, O.

Metal Blast, Inc., 871 E. 67th St., Cleveland, Ohio.

Pangborn Corp., Hagerstown, Md.

Pittsburgh Crushed Steel Co., Pittsburgh 1, Pa.

W. W. Sly Mfg. Co., 4753 Train Ave., Cleveland 2, Ohio.

Steel Shot & Grit Co., Inc., 39 Warren Ave., Boston, Mass.

SHOT (Peening)

Alloy Metal Abrasive Co., 311 W. Huron St., Ann Arbor, Mich.

American Wheelabrator & Equipment Co., Mishawaka, Ind.

American Steel Abrasive Co., Galion, O.

Cleveland Metal Abrasive Co., 887 E. 67th St., Cleveland, Ohio.

Metal Blast, Inc., 871 E. 67th St., Cleveland, Ohio.

Pangborn Corp., Hagerstown, Md.

Pittsburgh Crushed Steel Co., Pittsburgh 1, Pa.

Steel Shot & Grit Co., Inc., 39 Warren Ave., Boston, Mass.

SHOVELS

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.

Frederic B. Stevens, Inc., Detroit 16, Mich.

SHOVELS (Power)

Frank G. Hough Co., Libertyville, Ill.

SILICA FLOUR

Federal Foundry Supply Co., 4600 East 71st St., Cleveland 5, O.

Standard Silica Corp., 209 So. LaSalle St., Chicago 4, Ill.

Wedron Silica Co., 38 So. Dearborn St., Chicago, Ill.

SILICOMANGANESE

Electro Metallurgical Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.

SILICON (Briquets)

Electro Metallurgical Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.

Ohio Ferro-Alloys Corp., Canton 2, Ohio.

SILICON CARBIDE (Briquets)

Carborundum Co., Perth Amboy, N. J.

Electro Refractories & Abrasive Corp., Vars Bldg., Buffalo 2, N.Y.

SILVERY PIG IRON see Pig Iron (Silvery)

SKIMMERS

Tamms Industries Inc., 228 N. LaSalle St., Chicago 1, Ill.

SLIP FLASKS (See FLASKS, SLIP)

SLINGS (Chain)

Jeffrey Mfg. Co., Columbus 16, O.

SLIP JACKETS

Adams Co., Dubuque, Iowa.

Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.

Fremont Flask Co., Fremont, O.

Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.

SMELTERS & REFINERS

Christiansen Corp., 1515 No. Kilpatrick, Chicago 51, Ill.

Federated Metals Div., American Smelting and Refining Co., 120 Broadway, New York 5.

R. Lavin & Sons Inc., 3426 So. Kedzie Ave., Chicago 23, Ill.

Western Metals Co., 3201 So. Kedzie Ave., Chicago 23, Ill.

SNAGGING MACHINES

Bradford Machine Tool Co., 659 Evans St., Cincinnati, Ohio.

SNAGGING WHEELS—See ABRASIVE WHEELS

SNAP FLASKS

Adams Co., Dubuque, Iowa.

Federal Foundry Supply Co., 4600 East 71st St., Cleveland 5, Ohio.

Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.

V-G Flask & Fitting Co., Box 467, Madison, Conn.

SODA ASH

Federal Foundry Supply Co., 4600 East 71st St., Cleveland 5, Ohio.

Hercules Powder Co., Wilmington 99, Del.

Mathieson Chemical Corp., Mathieson Bldg., Baltimore 3, Md.

Solvay Sales Division, Allied Chemical & Dye Corp., 40 Rector St., New York 6, N. Y.

SOLDER

Federated Metals Div., American Smelting and Refining Co., 120 Broadway, New York 5.

SPACE HEATERS

Dravo Corp., Neville Island, Pittsburgh 25, Pa.

SPECIAL FOUNDRY ALLOYS

Federated Metals Division of American Smelting and Refining Co., 120 Broadway, New York 5, N. Y.

Niagara Falls Smelting & Refining Div. Continental-United Industries Co., Inc., 2204 Elmwood Ave., Buffalo 17, N. Y.

Vanadium Corp. of America, 420 Lexington Ave., New York, N. Y.

SPRAY GUNS

Murphy & Co., Jas. A., Hamilton, O.

New Haven Vibrator Co., 131 Chestnut St., New Haven 7, Conn.

SPRUE CUTTERS

Adams Co., Dubuque, Iowa.

Federal Foundry Supply Co., 4600 East 71st St., Cleveland 5, Ohio.

Freeman Supply Co., 1152 East Broadway, Toledo, Ohio.

Milwaukee Chaplet & Mfg. Co., 1023 S. 40th St., Milwaukee, Wis.

Rice Pump & Machine Co., 1026 S. 40th St., Milwaukee 15, Wis.

STEEL SHOT

American Wheelabrator & Equipment Co., Mishawaka, Ind.

Cleveland Metal Abrasive Co., 887 E. 67th St., Cleveland, Ohio.

Pangborn Corp., Hagerstown, Md.

Steel Shot Producers, Inc., Butler, Pa.

STEEL (Structural)

American Bridge Co., Pittsburgh 19, Pa.

STOPPERS (Graphite)

Joseph Dixon Crucible Co., Monmouth St., Jersey City, N. J.

STRAINER CORES

American Clay Forming Co., Tiffin, Ohio

Harbison-Walker Refractories Co., 1745 Farmers Bank Bldg., Pittsburgh 22, Pa.

STRIPPING MACHINES

Adams Co., Dubuque, Iowa.

Champion Foundry & Machine Co., 1553 W. Madison St., Chicago 7, Ill.

Davenport Machine & Foundry Co., Davenport, Iowa.

International Molding Machine Co., LaGrange Park, Ill.

Milwaukee Foundry Equipment Div., Spo Inc., 3238 W. Pierce St., Milwaukee 4, Wis.

TANKS (Dewatering)

Claude B. Schneible Co., 2827 25th St., Detroit 16, Mich.

TAPE (Friction & Rubber)

Boston Woven Hose & Rubber Co., 29 Hampshire, Cambridge 39, Mass.

TAPPING MACHINES

Cleveland Tapping Machine Co., Canton 6, Ohio

TELLURIUM

American Smelting & Refining Co., 120 Broadway, New York 5, N.Y.

TEMPERATURE CONTROLLERS

Foxboro Company, Foxboro, Mass.

Illinois Testing Laboratories, Inc. 418 N. LaSalle St., Chicago 10, Ill.

Leeds & Northrup, 4901 Stenton Ave., Philadelphia 44, Pa.

Marshall Co., L. H., 270 W. Lane, Columbus 1, O.

TESTING EQUIPMENT

Detroit Testing Machine Co., 19390 Grinnell Ave., Detroit 13, Mich.

National Forge & Ordnance Co., Irvine, Warren Co., Pa.

TESTING MACHINES (Tensile)

Harry Dietert Co., 9330A Roselawn Ave., Detroit 4, Mich.

Detroit Testing Machine Co., 19390 Grinnell Ave., Detroit 13, Mich.

National Forge & Ordnance Co., Irvine, Warren Co., Pa.

THERMOCOUPLES

Elematic Equipment Corp., 1150 W. Marquette, Chicago 2, Ill.

Claude S. Gordon Co., 3000 So. Wallace, Chicago 16, Ill.

Illinois Testing Laboratories, Inc., 418 N. LaSalle St., Chicago 10, Ill.

Marshall Co., L. H., 270 W. Lane, Columbus 1, O.

Pyrometer Instrument Co., Bergenfield, N. J.

Tamms Industries Inc., 228 N. LaSalle St., Chicago 1, Ill.

THREADING MACHINES

Cleveland Tapping Machine Co., Canton 6, Ohio

TIMERS (Electric)

Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa.

TIN

Federated Metals Div., American Smelting and Refining Co., 120 Broadway, New York 5, N. Y.

TONGS

Industrial Equipment Co., Minster, O.

TOOLS (Pneumatic Portable)

Arrow Tools Inc., 1900 S. Kostner, Chicago, Ill.

Chicago Pneumatic Tool Co., 6 East 44th St., New York 17, N. Y.

Dayton Pneumatic Tool Co., Dayton 1, O.

Gardner-Denver Co., Quincy, Ill.

Independent Pneumatic Tool Co., Aurora, Ill.

Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.

Joy Mfg. Co., Sullivan Division, Michigan City, Ind.

Schramm Inc., West Chester, Pa.

TORCHES and BURNERS (Acetylene, Gas, Oil)

Freeman Supply Co., 1152 East Broadway, Toledo, Ohio.

Hauck Mfg. Co., 106 Tenth St., Brooklyn 15, N. Y.

Linde Air Products Co., 30 E. 42nd St., New York 17.

TOTE BOXES (see "BOXES-TOTE")

TRACTOR (Gas Powered)

Frank G. Hough Co., Libertyville, Ill.

TRADE ASSOCIATIONS

Crucible Manufacturers Association, 90 West St., New York 6, N. Y.

TRAMRAIL SYSTEMS

American MonoRail Co., 13104 Athens Ave., Cleveland 7, Ohio.

Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1155 East 283rd St., Wickliffe, O.

Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.

Modern Equipment Co., Port Washington, Wis.

TRAPS

Jas. A. Murphy & Co., Hamilton, Ohio.

TROLLEYS

Curtis Pneumatic Machinery Div. Curtis Mfg. Co., 1943 Kienlen Ave., St. Louis 20, Mo.

Modern Equipment Co., Port Washington, Wis.

TRUCK CRANES

Silent Hoist & Crane Co., 885 63rd St., Brooklyn 20, N. Y.

TRUCK WHEELS

Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.

TRUCKS (Casting)

Kwix-Mix Co., Port Washington, Wis.

Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.

TRUCKS (Core)

Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.

TRUCKS (Core Oven)

Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.

Kirk & Blum Mfg. Co., Cincinnati 9, Ohio.

TRUCKS (Power Lift)

Frank G. Hough Co., Libertyville, Ill.

Towmotor Corp., 1226 East 152nd St., Cleveland 10, Ohio.

TUBES (Annealing)

Pressed Steel Co., Wilkes-Barre, Pa.

TUBES (X-Ray)

General Electric Co., X-Ray Dept., 4855 Electric Ave., Milwaukee 14, Wis.

TUMBLING BARRELS

Royersford Foundry & Machine Co., Royersford, Pa.

W. W. Sly Mfg. Co., 4753 Train Ave., Cleveland 2, Ohio.

Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.

Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

TURNTABLES

Beardsley & Piper Co., The, 2424 No. Cicero, Chicago 39, Ill.

Modern Equipment Co., Port Washington, Wis.

Newaygo Engineering Co., Newaygo, Mich.

Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

UNIT HEATERS (Electric)

Dravo Corp., Neville Island, Pittsburgh 25, Pa.

VALVES (Adjustable Orifice, Air, Gas, Oil, Water, Steam)

The North American Mfg. Co., 4455 E. 71st St., Cleveland 4, Ohio.

VALVES (Air, Water, Steam)

Air-Way Pump & Equipment Co., 1050 N. Kilbourn, Chicago, Ill.

The North American Mfg. Co., 4455 E. 71st St., Cleveland 4, Ohio.

VALVES (Blow-off and Cut-off)

Champion Foundry & Machine Co., 1553 W. Madison St., Chicago 7, Ill.

Wm. H. Nichols Co., Richmond Mill, Long Island 18, N. Y.

VALVES (Oxygen, Acetylene)

Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y.

VENTILATING SYSTEMS

American Wheelabrator & Equipment Co., Mishawaka, Ind.

Harvey P. Bertram Co., 1008 W. Ninth St., Cincinnati, Ohio

Hartzell Propeller Fan Co., Piqua, Ohio.

Joy Mfg. Co., La-Del Division, New Philadelphia, Ohio.

Kirk & Blum Mfg. Co., Cincinnati 9, Ohio.

Pangborn Corp., Hagerstown, Md.

Schneible Co., Claude B., 2827—25th St., Detroit 16, Mich.

W. W. Sly Mfg. Co., 4753 Train Ave., Cleveland 2, Ohio.

VENTS (Core Box)

Champion Foundry & Machine Co., 1314 W. 21st St., Chicago 8, Ill.

VENTS (Core Box) (Cont'd.)

Demmler & Bros., Wm. Kewanee, Ill.

C. M. Smillie & Co., 1124 Woodward Hgts. Blvd., Ferndale 20, Mich.

VIBRATORS

Adams Co., Dubuque, Iowa.

Beardsley & Piper Co., 2424 No. Cicero, Chicago 39, Ill.

Cannon Vibrator Co., 1111 Power Ave., Cleveland 14, Ohio.

Cleveland Vibrator Co., 2828 Clinton Ave., W., Cleveland 13, Ohio.

Davenport Machine & Foundry Co., Davenport, Iowa.

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.

Foundry Supplies & Mfg. Co., 2221 Orchard St., Chicago 14, Ill.

Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa.

Link Belt Co., 300 W. Pershing Rd., Chicago, Ill.

Martin Engineering Co., Kewanee, Ill.

Milwaukee Foundry Equipment Co., 3238 W. Pierce St., Milwaukee, Wis.

New Haven Vibrator Co., 131 Chestnut St., New Haven 7, Conn.

Nichols Co., Wm. H., Richmond Hill, Long Island 18, N. Y.

Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, Ohio.

S P O Incorporated, 7500 Grand Division Ave., Cleveland 5, O.

Frederic B. Stevens, Inc., 18th St. & Vernor Highway, Detroit 16, Mich.

Syntron Company, Homer City, Pa.

Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.

VISES (Hydraulic, Mechanical, etc.)

Columbian Vise & Mfg. Co., 9021 Bessemer Ave., Cleveland, Ohio.

Desmond-Stephen Mfg. Co., Urbana, Ohio.

WASH ROOM EQUIPMENT

Bradley Washfountain Co., Box 732, Milwaukee 1, Wis.

WAX (Core, Vent, Pattern)

United Compound Co., Inc., 328 South Park Ave., Buffalo 4, N. Y.

WEDGES (Foundry)

Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.

WEIGHING DEVICES

Toledo Scale Co., Toledo, Ohio.

WELDING GAS

Air Reduction Sales Co., 60 East 42nd St., New York 17, N. Y.

Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y.

WELDING APPARATUS (Electric arc)

Air Reduction Sales Co., 60 East 42nd St., New York 17, N. Y.

Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y.

WELDING and CUTTING APPARATUS and SUPPLIES

Air Reduction Sales Co., 60 East 42nd St., New York 17, N. Y.

Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y.

WELDING ELECTRODES (Carbon)

National Carbon Co., Div. Union Carbide & Carbon Corp. 30 E 42nd St., New York 17, N. Y.

United States Graphite Co., Saginaw, Mich.

WELDING RODS & ELECTRODES

Air Reduction Sales Co., 60 East 42nd St., New York 17, N. Y.

International Nickel Co., Inc., 67 Wall St., New York 5, N. Y.

Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y.

WETTING AGENTS

Pelron Corp., 7740 West 47th St., Lyons, Illinois.

WHEELBARROWS

Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.

WHEELS, ABRASIVE (Cut-off)

Bay State Abrasive Products Co., Westboro, Mass.

Carborundum Co., Perth Amboy, N. J.

Electro Refractories & Abrasives Corp., Vars Bldg., Buffalo 2, N. Y.

Macklin Company, Jackson, Mich.

Norton Company, Worcester 6, Mass.

Raybestos-Manhattan, Inc., Manhattan Rubber Division, Passaic, N. J.

Simonds Abrasive Co., Tacony & Fraley Sts., Philadelphia 37, Pa.

Sterling Grinding Wheel Division, Cleveland Quarries Co., Tiffin, Ohio.

WHEELS (Wire Brush)

Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, Ohio.

WIRE BENDERS

Redford Iron & Equipment Co., 20733 Glendale Ave., Detroit 23, Mich.

WIRE BRUSHES

Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, Ohio.

WIRE CUTTERS

Federal Foundry Supply Co., 4600 East 71st St., Cleveland 5, Ohio

Redford Iron & Equipment Co., 20733 Glendale Ave., Detroit 23, Mich.

WIRE NAILS

Republic Steel Corp., 3100 E. 45th St., Cleveland 4, Ohio.

WOODWORKING MACHINERY

Do All Company, Des Plaines, Ill.

Oliver Machinery Co., Grand Rapids 2, Mich.

X-RAY EQUIPMENT

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.

General Electric Co., X-Ray Dept. 4855 Electric Ave., Milwaukee 14, Wis.

X-RAY FILMS

Eastman Kodak Co., Rochester, N. Y.

General Electric Co., X-Ray Dept. 4855 Electric Ave., Milwaukee 14, Wis.

ZINC

Federated Metals Div., American Smelting and Refining Co., 120 Broadway, New York 5, N. Y.

ZIRCON SAND

Orefraction Inc., 7425 Thomas St., Pittsburgh 8, Pa.